Ocean

QA Software for
Barracuda and Piranha

Ocean Reference Manual - English - Version 2.3A

Welcome to Ocean

Ocean is a is a powerful tool for everybody working with Quality Assurance of X-ray systems. Ocean can be used with the X-ray meters Pirahna and Barracuda from RTI Electronics..



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Intended Use of the Ocean Software

Together with instruments from RTI Electronics AB it is to be used for independent service and quality control, as well as measurements of kerma, kerma rate, kVp, tube current, exposure time, luminance, and illuminance within limitations stated below.

If installed according to accompanying documents, the product is intended to be used together with all diagnostic X-ray equipment except for:
- therapeutical X-ray sources.
- X-ray equipment with tube potential below 20 kV.
- X-ray equipment on which the instrument cannot be mounted properly, e.g. equipment where the beam field size is narrower than the active part of the detector.
- specific types of X-ray equipment listed in the instructions for use or in additional information from the manufacturer.

With the X-ray installation in stand-by conditions without patients present, the product is intended to be used:
- to provide the operator with information on radiation beam parameters that might influence further steps in an examination but not an ongoing exposure.
- for assessing the performance of the X-ray equipment.
- for evaluation of examination techniques and procedures.
- for service and maintenance measurements.
- for quality control measurements.
- for educational purposes, authority supervision etc.

The product is intended to be used by hospital physicists, X-ray engineers, manufacturer's service teams, and other professionals with similar tasks and competencies. The operator needs a short training to be able to use the product as intended. This training can be achieved either by careful study of the manual, studies of the built-in help function in measurement software or, on request, in a short course ordered from the manufacturer.

The product is intended to be used inside X-ray rooms ready for clinical use and can safely be left switched on and in any measuring mode in the vicinity of patients.

The product is NOT intended to be used:
- for direct control of diagnostic X-ray equipment performance during irradiation of a patient.
- so that patients or other unqualified persons can change settings of operating parameters during and immediately before and after measurements.

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Chapter 1

Welcome to Ocean

1 Welcome to Ocean



Ocean *is a powerful software for X-ray Quality Assurance work. Use Ocean with the Piranha or Barracuda to significantly increase the quality and efficiency of your X-ray QA process.*

You can set up templates to automate X-ray equipment testing, analyse the test data and store the data, waveforms and analysis results for future reference or re-use.

There are three different levels for Ocean: Display, Connect and Professional.

Display

This mode is used as a "display" for your meter. You can choose the measurements you want, customize your display appearance and save your choices as a template. When you use a template, you will see the measurements, data analysis along with available waveforms on the screen. You can easily recall any template you made when you need it.

Connect

This mode offers everything that Display does, plus the convenience of exporting your data directly into Excel or OpenOffice Calc. You can design your own spreadsheet and Ocean, in this mode, automatically fills out your spreadsheet with the measured values from the meter.

Professional

This mode offers everything that Display and Connect does, plus the possibility to set up templates that perform a complete job for you, including measuring data with the meter, checklists and analyse the data according to the pass/fail criteria you have set up. The data is stored and a report is generated.

1.1 General information

Your meter must have an Ocean license key installed before you can use the software and the Piranha or Barracuda together. When you connect your meter to Ocean the license key is validated and Ocean will show the license level on the main caption bar. There are three license levels available to you: Display, Connect or Professional.

The Display license level is free and you can get a licence from our website at http://www.rti.se/try-ocean-for-free/.

If you purchase the Connect or Professional licence after you purchased the meter, you will receive an installer along with your meter and the licence information will be installed into your meter when you connect Ocean and the meter together the first time. If you purchase Connect or Professional at the same time as you purchase your meter, the meter will come with the licence information permanently installed and no licence key is required.

We have added a 'keyboard mode" feature to Ocean that allows you to use the software without the meter connected to it. It's a great way to create templates right at your desk, or if you need to do some quick testing and don't want to set up the meter, you can just make your measurements and enter the data by hand. Since almost every functionality your licence level offers is available in this mode (except items you can only do while connected to a Piranha or Barracuda), you can experience the power and versatility of this software even if you don't own a Piranha or Barracuda presently. We are confident that once you tried Ocean, you will not only want to use the software but harness it's true potential by purchasing a Piranha or Barracuda as well.

To skip the rest of the information and get started right away, go to the Getting started topic now.

1.2 Important definitions

The follwoing definitions are important to understand when you use this help text.

Acceptance limits
The pass and fail criteria set up in a test by the user.

Analysis
A calculation done on a selected number of exposures to evaluate the performance of an x-ray generator or other equipment.

Checklist
A checklist is a list containing questions or tasks that is part of the x-ray equipment quality assurance process and done as part of regular preventative maintenance. Acceptable answers are pre-determined and set up by the user.

Equipment
The equipment in a room that is to be tested.

General settings
Set values that are common for the entire test.

Grid
The grid is where all measured data and set values are stored. It consists of a number of columns and rows.

Meter settings
Settings for the Piranha or Barracuda that control meter functions.

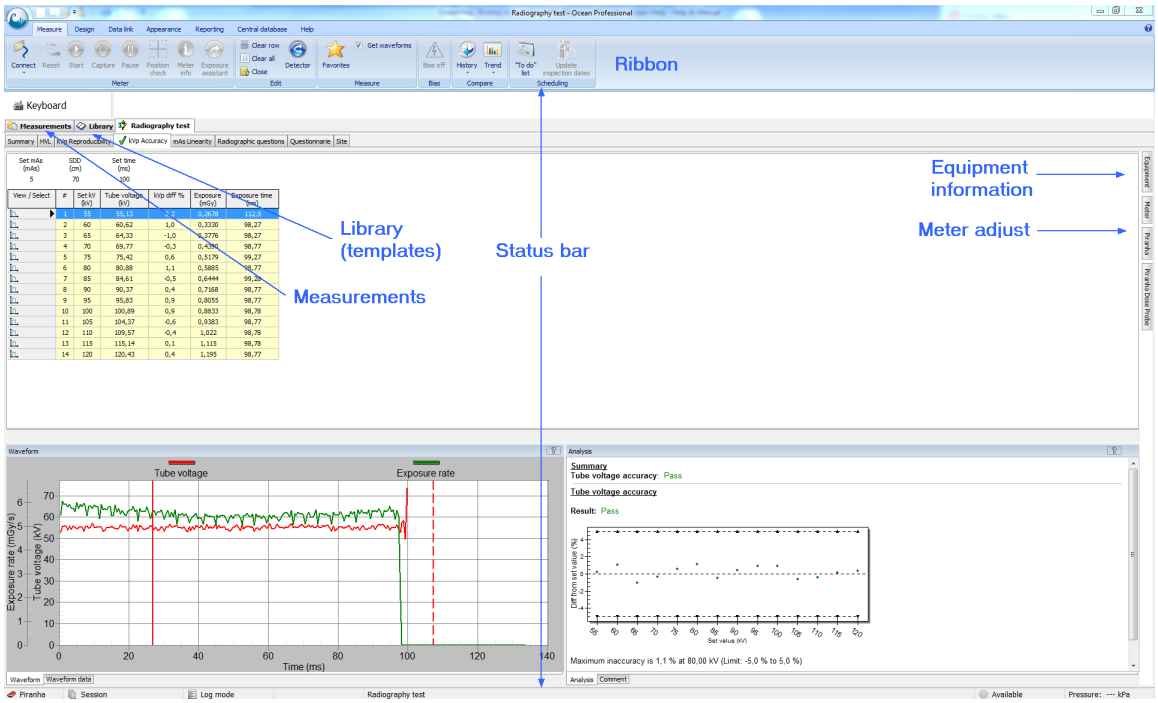
Real-time display (RTD)
The real-time display is a feature used to make quick measurements when data needs to be collected quickly. The data is presented in a series of displays chosen by the user and stored in a log.

Session
A session is specifying a complete job (a preventative maintenance schedule, for example). It normally consists of a number of test protocols (templates) and one or more checklists.

Site
A site is the place where a testing procedure (session) is performed. A site is a facility, department and a room with its equipment.

Template
A template is a session, test, checklist or real-time display without any measured data.

1.3 Main screen



Click to enlarge

Here is a picture of the Main screen. There is a lot of information on this screen so make sure you read carefully your menu choices. All key functions are found on the "ribbon" bar for easy access. The ribbon is divided into six tabs and each tab has a collection of similar functions:

Measure - here you will find everything related to measurements (such as detector selection, connect to meter, set bias, get waveforms, etc.)

Design - under this tab you will find all the functions for creating, saving and editing templates

Data link - this tab has the choices for customizing your data link to Microsoft Excel or OpenOffice Calc

Appearance - you can change how things are shown on the main screen with these functions

Reporting - these are all the functions you need to create, edit and print out reports the way you like it

Help - get help

Just below the ribbon and on the bottom of the main screen you find two status bars.

The status bar located just below the ribbon status bar is divided into two parts: the left part indicates what the meter is doing right now and the right part is used to display messages and information.

The status bar located at the very bottom of the main screen shows current meter being used, work mode, battery indicator for the meter and more.

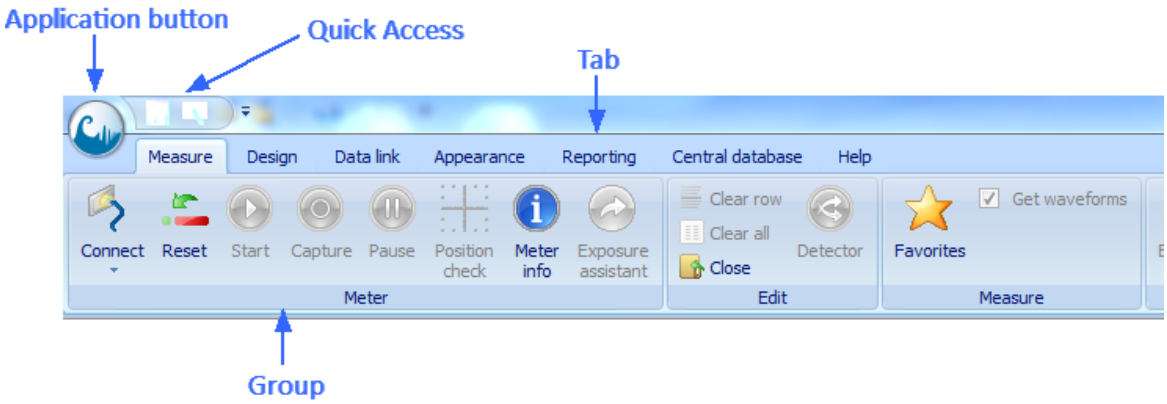
There are two tabs (Measurements and Library) located on the top left of the main screen just below the ribbon.

Measurements - This is where you will find all your measured and saved data. The saved data from the real-time display is also found here. If you are using Professional license, you can also see your facilities, rooms and tubes here with their corresponding data.

Library - This is where all your templates are stored. A template is a "blank protocol" without any measured data recorded.

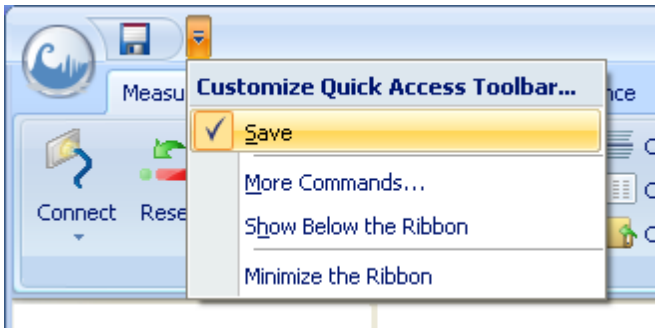
1.3.1 Ribbon

The ribbon is the command bar that organizes Ocean's features for easy access via tabs located at the top of the Main screen window. There are six of these tabs to keep similar functions grouped together. To read what's on the ribbon go to main functions.



Click to compress

There is an **Application button** located on the top left of the Main screen. If you click it, the **Application menu** is shown. There is also a **Quick Access Toolbar** located next to the application button.



Click to compress

You can customize the Quick Access Toolbar to suit your own preference by selecting the **More commands...** option. Use the **Minimize the Ribbon** function if you want to compress the Ribbon. This is especially useful when using a Netbook since the screen height on a Netbook computer is limited.

1.3.2 Status bars

There are two status bars providing information to assist you while working with Ocean.

Upper status bar

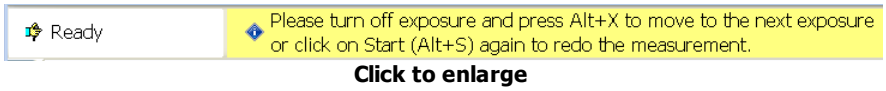
The upper status bar (Status bar #1) is divided into two sections. The left is used to indicate what the meter is doing right now:



Click to enlarge

While the background is red, don't click on any buttons or make exposures. The meter will not respond to commands while adjusting itself.

The right part shows messages that will guide you in certain situations:


Ready
Please turn off exposure and press Alt+X to move to the next exposure or click on Start (Alt+S) again to redo the measurement.

Click to enlarge

When the background is yellow, Ocean is showing an important message that requires you to take some kind of action. Read the message and follow the instructions.

Lower status bar

The lower status bar (Status bar #2) is divided into five sections:



Click to enlarge

Section #1 (left) shows which meter currently is used

Section #2 shows what you are working on currently

Section #3 shows which working mode you are in currently ("Log mode" is shown when you are recording data and "Design mode" is shown when you are creating/modifying a template)

Section #4 shows the battery status for the connected meter

Section #5 shows the title of the object you are working with currently

Section #6 shows if you are connected to Ocean Central

Section #7 shows air pressure (only Barracuda with EMM-Bias W delivered before March 1, 2012. EMM-Bias W modules delivered after this date doesn't have any sensor and will not report the air pressure.)

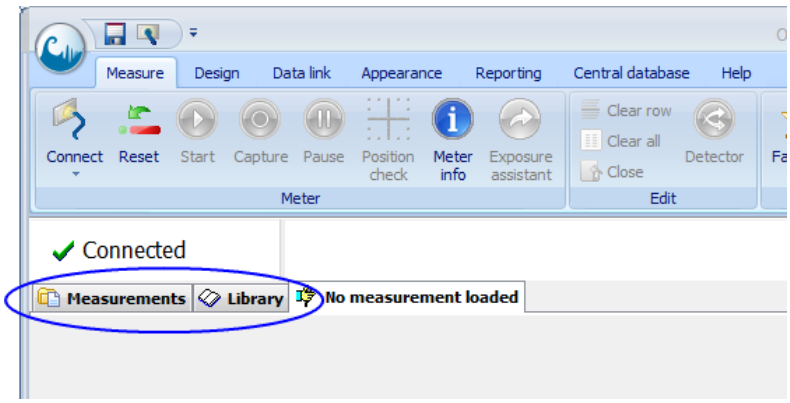
IMPORTANT!
Design mode: If you are working in Design mode, no measured data is saved when you click the save button. Only the empty template is saved in this mode.

Log mode: If you are in Log mode, everything is saved including the measured data.

1.3.3 Database browser

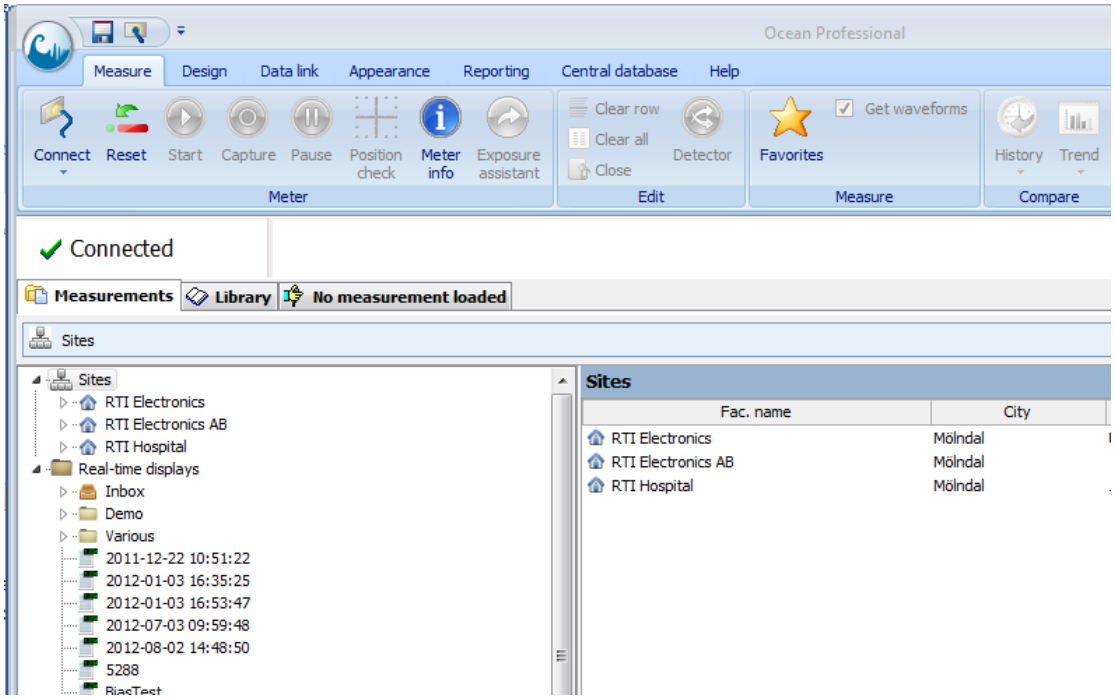
All your data, measured sessions, measured real-time displays and templates, are stored in the database. The database is divided into two main parts, Measurements and Library. In Measurements are measured sessions and real-time displays stored and in the Library are templates stored.

You can browse through your measurements and templates buy clicking on the two tabs Measurements and Library:



Click to enlarge

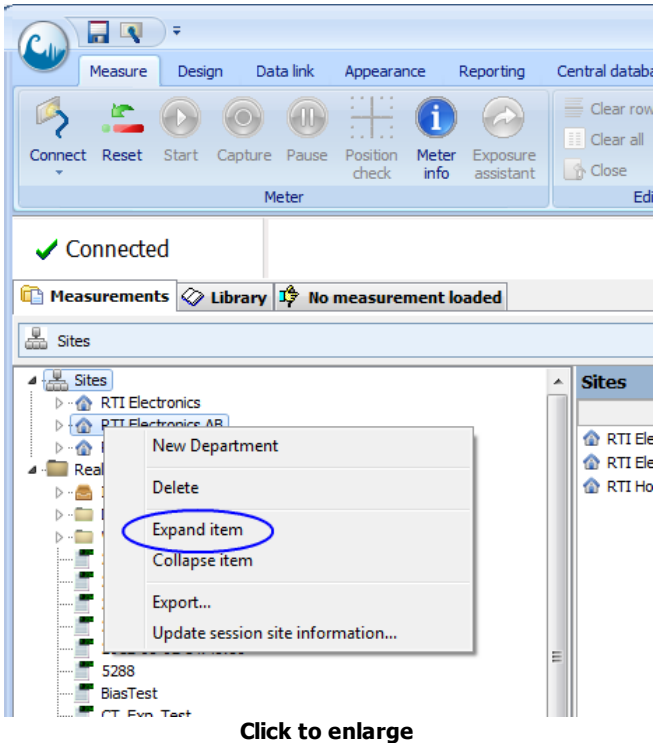
Click on Measurements to browse the measurements:



Click to enlarge

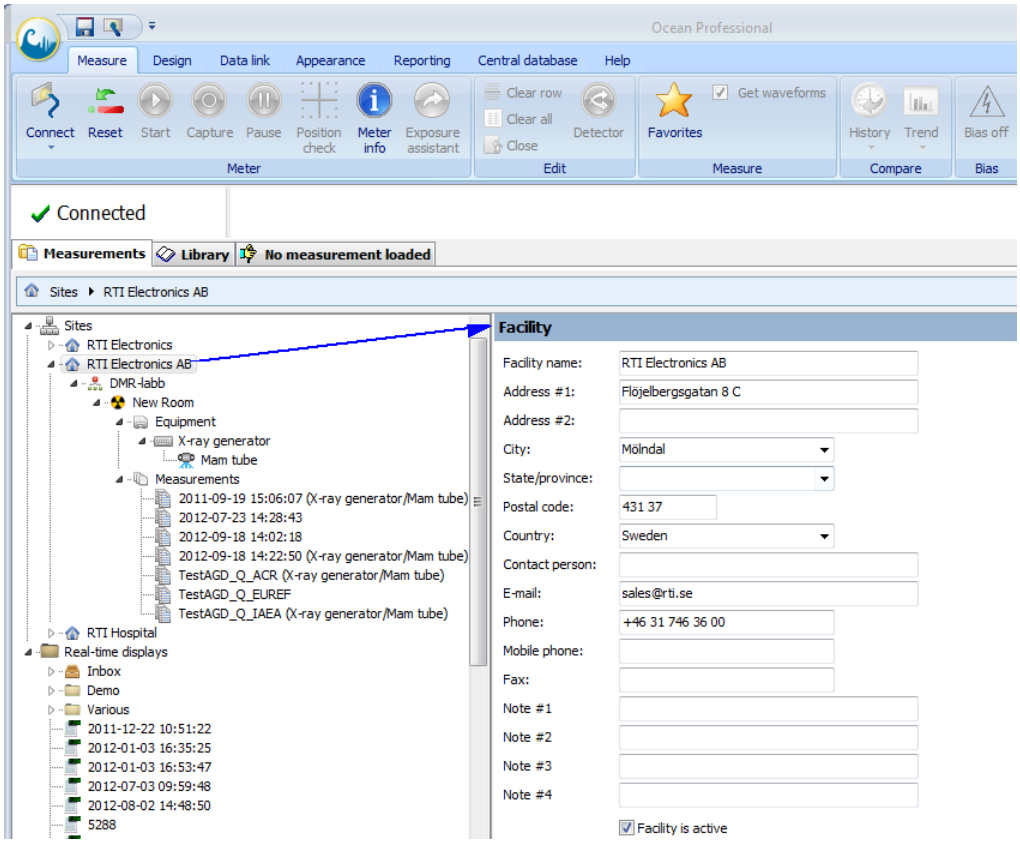
The left part shows the "database tree" and the right part shows the content of the selected "folder". You can browse through templates in the same way. There is a search function available.

You can right-click on a "folder" and select Expand all to open it and all its sub folders:



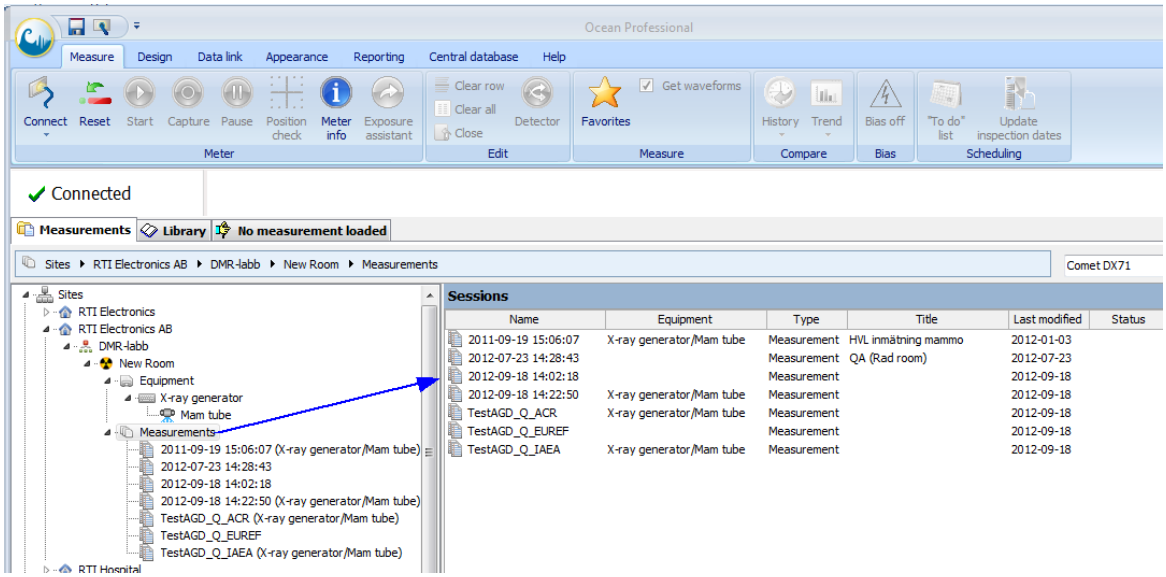
Click to enlarge

If you click in an item belonging to the site (facility, department, room, generator, tube or user-defined equipment) the corresponding details are shown to the right:



Click to enlarge

If you instead click on a folder its content is shown on the right side:



Click to enlarge

1.4 Getting started

To get started, install Ocean on your computer and make sure that your meter has an Ocean license in it. There are three possible license choices: Display, Connect and Professional. The Display is a free license and is already installed in all new units. Older units may not have this license and in this case you can get one from our website at http://www.rti.se/try-ocean-for-free/.

There are two topics describing how to make your first measurement: "Display and Connect" and "Professional". If you are using the Professional license, read both sections, as both are relevant to you

and available for your use. If you use Display or Connect license read the "Display and Connect" section only as this is the only option available for you.

Before using your meter with Ocean, make sure that your Piranha or Barracuda has the latest firmware.

1.4.1 Installation

You must have Windows XP, Window Vista or Windows 7 to run Ocean. Your computer must also have USB port or Bluetooth. Display graphics should be 800X600 or higher.

The Ocean installer is located on the Product CD you received with your Instrument. To install please follow the steps below:

Note! You must have administrator level access to the computer you are installing Ocean on to install the software.

1. Insert the product CD into the CD drive. The CD menu starts automatically (if not, locate and run Start.exe). If you are not installing Ocean from a Product CD, run the file **Setup Ocean.exe**.

2. Move the cursor to **Install** and select Ocean.

3. Follow the instructions on the screen to complete the installation process.

4. When the installation of Ocean is completed, the installer for the **Microsoft Access database engine** starts automatically. Microsoft Access database engine is required to run Ocean.

5. There are two possible scenarios:

You already have Microsoft Access database engine on your computer
If you already have Microsoft Access on your computer, a dialogue will be shown asking if you want to Reinstall/Repair or Uninstall the database engine. You want neither, so click on the Cancel button at the bottom of the dialogue. Confirm that you want to abort and continue.

You don't have Microsoft Access database engine on your computer
If you don't have Microsoft Access on your computer, there is a copy of the database engine included in your Product CD and the installation will be done automatically. Just follow the instructions on the screen to complete the installation.

6. A dialogue is shown when the installation process is complete. Here you can select the "Start Ocean" checkbox and Ocean will start immediately upon closing the dialogue box.

When you run Ocean for the first time a **Start up wizard** will guide you through a series of steps to choose the default settings according to your preference. You will also be asked which meter you have and what you use it for to allow Ocean to load your database with suitable templates and examples. These examples will be placed in Library folders called **Examples (RTI)**. This folder is a system folder and cannot be erased, nor can you erase content from these folders.

1.4.2 Licence for your meter

The license level is stored in your meter. Each time you start Ocean with a meter it adapts to the license level of the currently connected meter. For example, if you have a Piranha with Professional license that you normally use, but you borrowed your colleague's Barracuda with only a Connect license and connected it to your Ocean, when Ocean communicates with the Barracuda, only the Connect license options will be available to you. If you are unsure which level you have, follow the steps below to find out:

1. Power on your meter.

2. Connect the meter to your computer (or make sure that you have a Bluetooth connection).

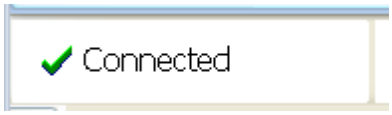
3. Start Ocean. If it is the very first time you start Ocean a "Start-up wizard" will help you get started. Provide the information required by the wizard.

4. A window titled "Select favorite" is now shown. Click Cancel to close it.

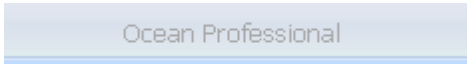
5. Go to the Measure tab on the ribbon and choose Connect.

6. Ocean will now try to connect to your meter. If your meter has a license, the upper status bar below the ribbon will show Connected (see picture below) and you can start measuring. If you meter doesn't have a license, Ocean will ask you to provide one. You can get the free Display license key from our website at http://www.rti.se/try-ocean-for-free/ or contact us to purchase a Connect or Professional license.

NOTE: You cannot use Ocean without a license and if you don't have one, you must abort at this point until you obtain a license key. Once you have a license key, continue from this point by following the steps to load the license key into your meter.



7. Now check the main title bar at the top of the Ocean Main screen and it will show what license level you have:



Depending on what license level you are using, read:

- Getting started with Display and Connect

- Getting started with Professional

1.4.3 Display and Connect

The example below shows how to start a real-time display from the Favorites screen. You can load any real-time display template from the Library tab at any time. Read the topic Start a new real-time display for a complete description of how this is done.

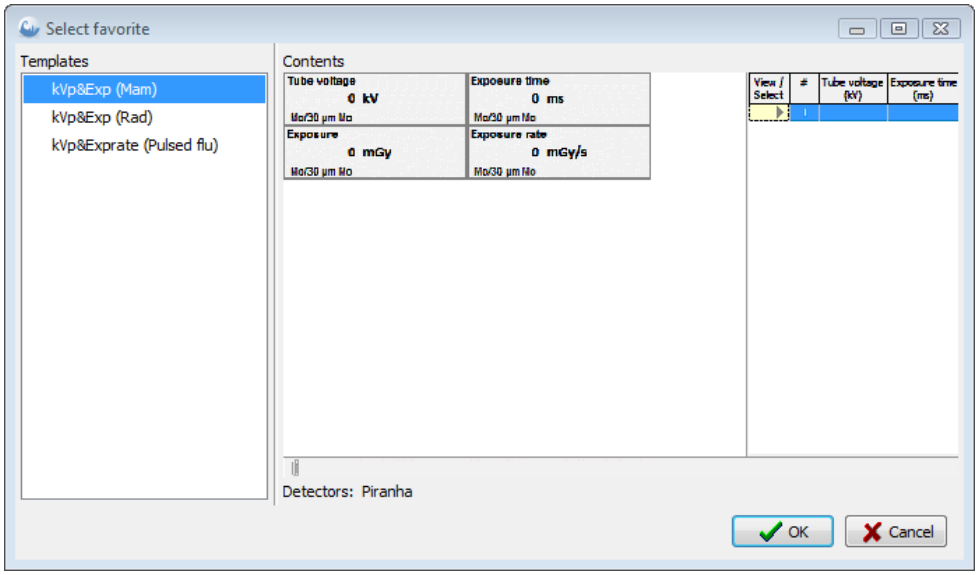
To start a real-time display from the Favorites screen, follow the instructions below:

1. Connect the meter to your computer (or make sure that you have a Bluetooth connection).

2. Power on your meter.

3. Start Ocean. If it is the very first time you start Ocean a "Start-up wizard" will be shown. Provide the information required by the wizard.

4. When the wizard is done, the Favorites window (see below) is shown.

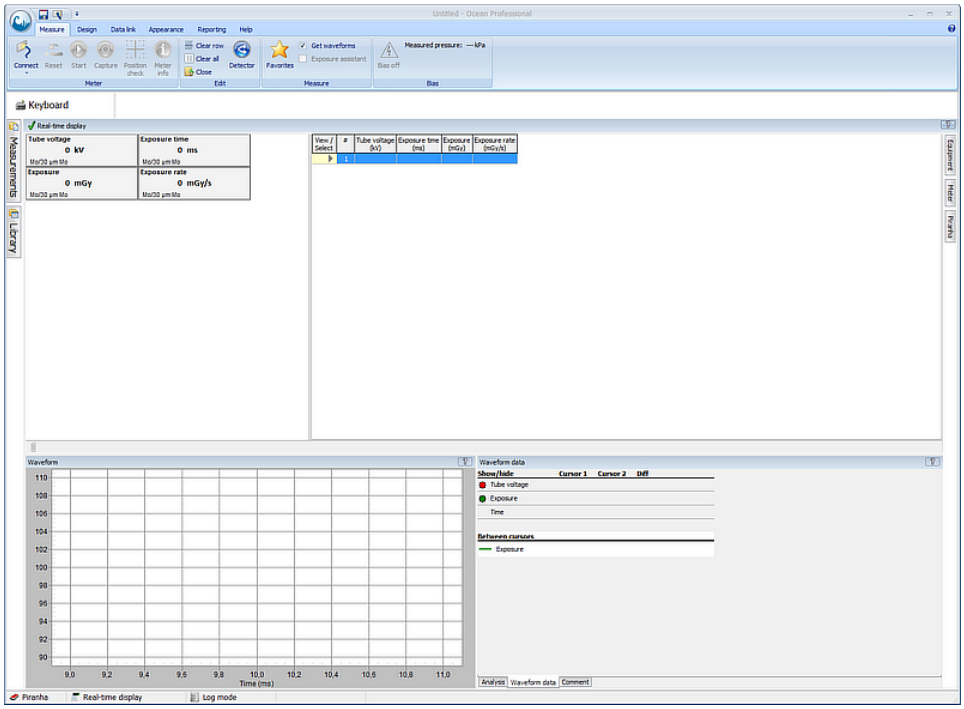


Click to enlarge

5. Select a real-time display suitable for the work you want to do and that is available to your meter. You will see the available choices on the left side of the screen under the "Templates" heading (see picture above).

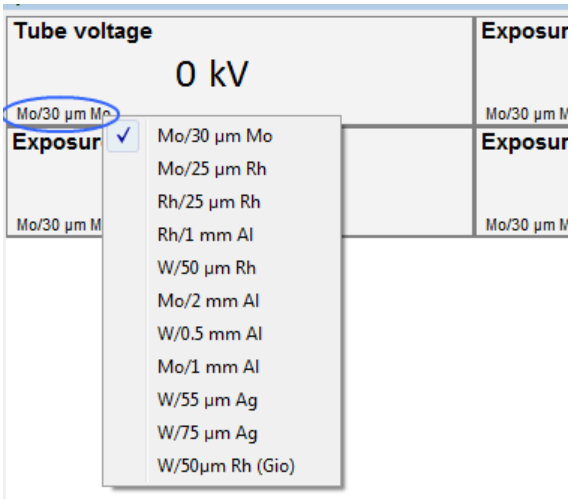
6. Click OK.

7. Ocean will now connect to your meter and load the chosen real-time display.



Click to enlarge

8. If you are measuring on mammography or CT you may want to select another calibration. The calibration shown is in the lower left corner of the display. Click on it if you want to change it:



Click to enlarge

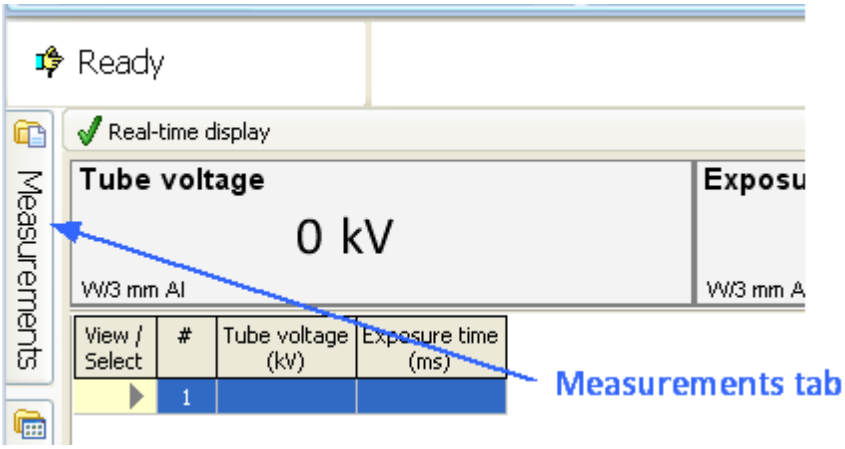
9. You are now ready to make an exposure.

10. When the exposure is finished, the results will be shown in the displays and a waveform will be shown in the waveform window on the bottom left of your screen.

11. You can continue making exposures one after another until your task is complete.

12. Click on the save button when you are done (on the Quick Access Toolbar or on the Application menu) to save your work. You will be asked to specify a name for the measurements you have just completed.

13. Your work is now saved in the database. If you want to see it again later, you can look for it under the Measurements tab to the right of the displays.



You can load any template from the Favorites screen by clicking on the Favorites button, or from the Library tab located to the left of the displays. Read more about real-time displays by clicking on the links below:

- How to start a new real-time display - click here...
- How to design a real-time display template - click here...

1.4.4 Professional

This example shows how to start a session from the Favorites screen. You can load any session or real-time display template from the Library tab. Read Start a new session for a more detailed description of this topic. To read more on how to start a real-time display, go to the Display and Connect topic.

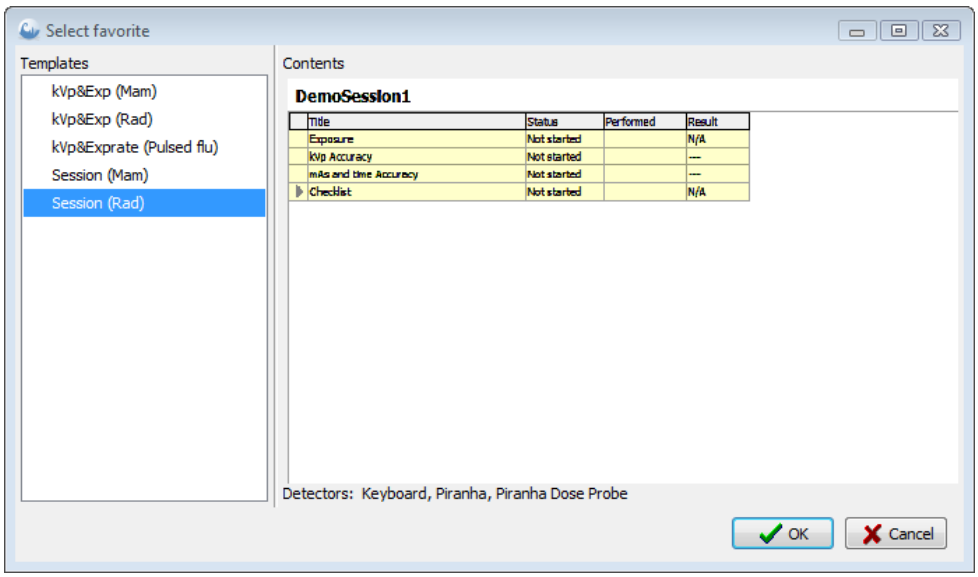
To start a session from the Favorites screen follow the steps as described below:

1. Power on your meter.

2. Connect the meter to your computer (or make sure that you have a Bluetooth connection).

3. Start Ocean. If it is the very first time you start Ocean a "Start-up wizard" will be shown. Provide the information required by the wizard.

4. When the wizard is done, the Favorites window (see below) is shown:



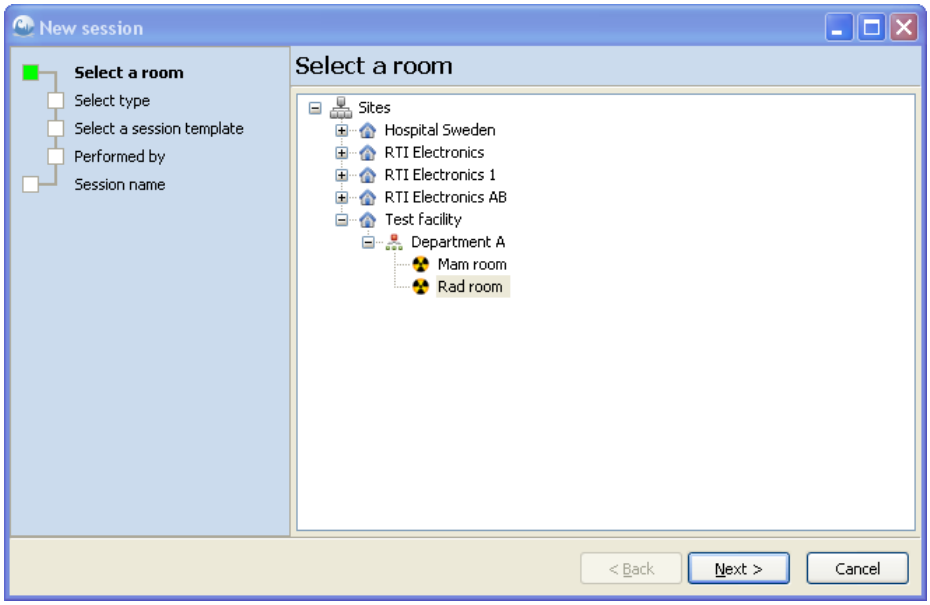
Click to enlarge

5. Select a session suitable for the work you want to do and that is available to your meter. You will see the available choices on the left side of the screen under the "Templates" heading (see picture above).

6. Click OK.

7. Ocean will now connect to your meter and load the chosen session.

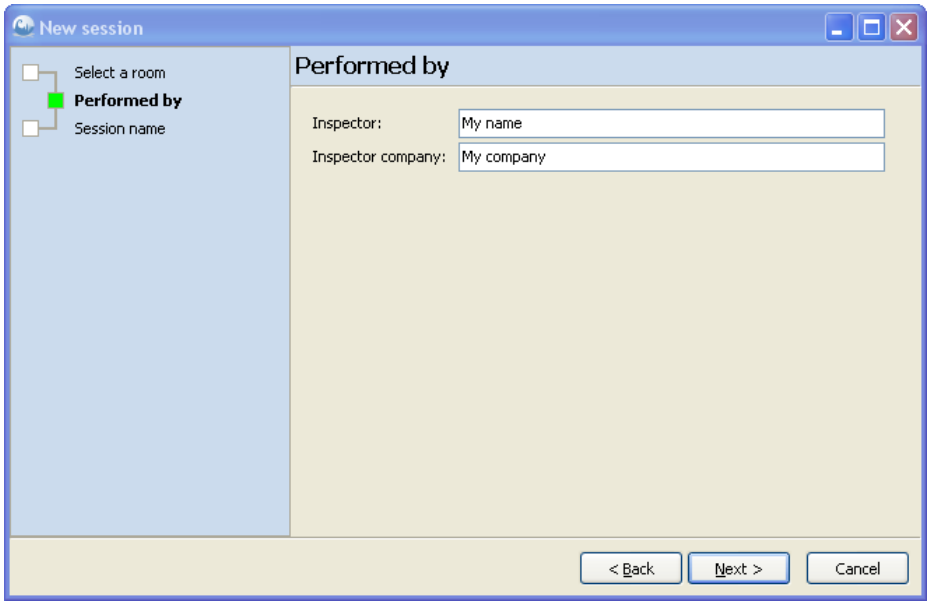
8. The first thing you will be asked to do is to specify a site (a hospital or medical clinic) where this session will be used. If this is the first time you use Ocean, there will be no available sites so you will need to create a site, department, room and equipment. To learn how to create a new site read the topic New site. We have added a "test site" for you to try out the different features Ocean has to offer, and for this example, click on the "Test facility". There is only one department, so select "Department 1". Finally, select a suitable room (for this example, choose the "Rad room").



Click to enlarge

9. Click Next to continue.

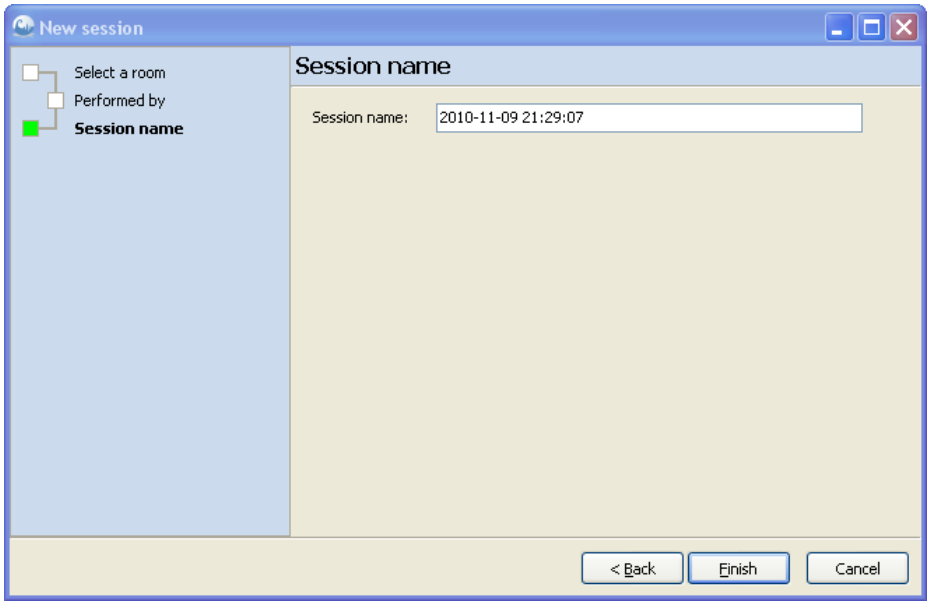
10. You are now asked to provide your name and the organization name you work for (company). If you ran the start-up wizard previously, this information would already be filled out.



Click to enlarge

11. Click Next to continue.

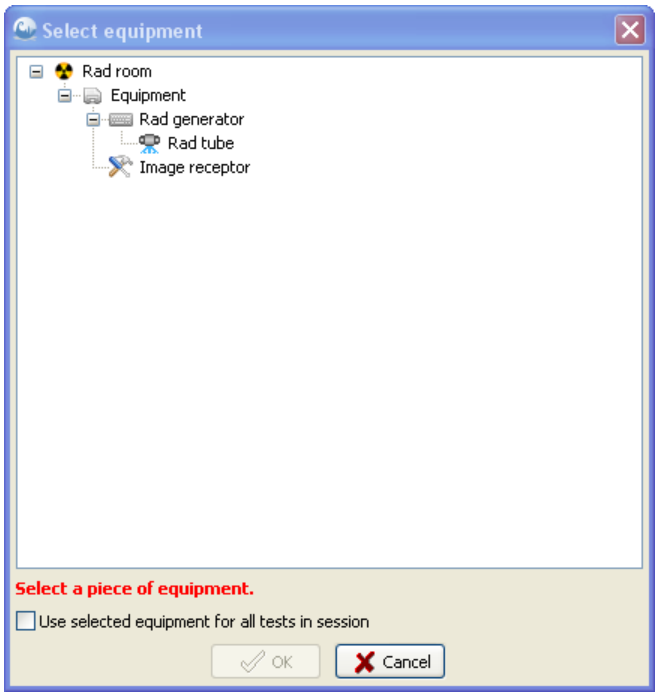
12. You need to specify a name for your session (the default name is a date and time stamp) For this example, just leave the name at the default setting.



Click to enlarge

13. Click Finish.

14. You have now opened the session. When you open a session Ocean will automatically start you off with the first test in the session. Before you can start making measurements, you will need to select the equipment you will be testing. To learn more about how to add new equipment to a site, read the Add more departments and rooms topic of this manual.

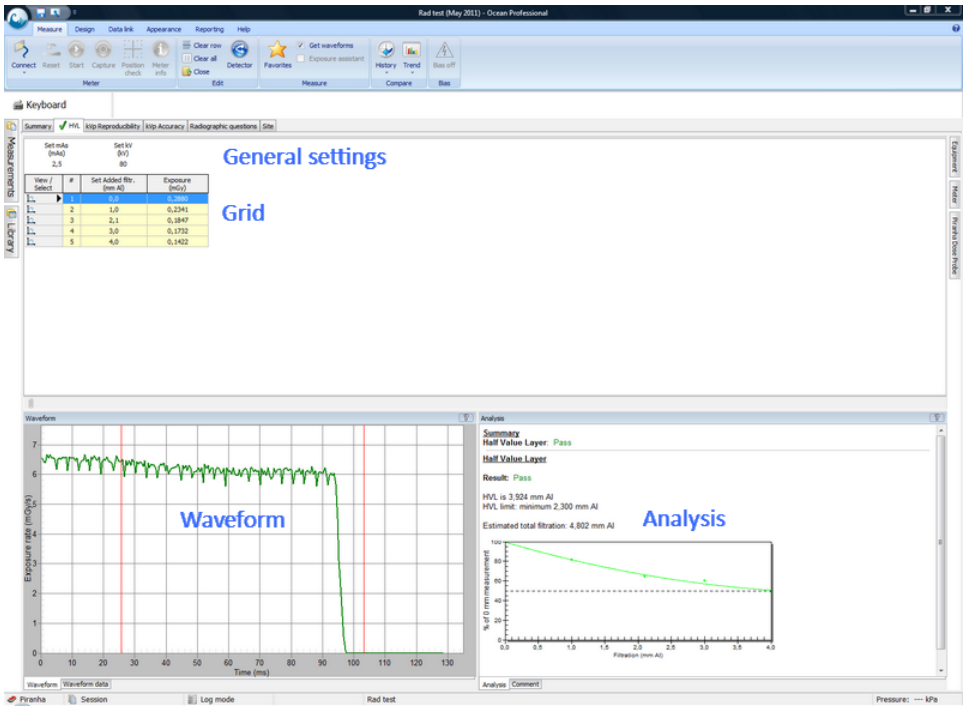


Click to enlarge

15. For this example, choose the "Rad tube" and click OK.

16. The first test in the session (in this case the HVL test) is activated and your cursor is positioned on the first row in the grid. You are now ready to make exposures according to the conditions specified in the test.

17. As you make your exposures, you will see measured data appearing in the grid along with the corresponding waveforms in the waveform window to the bottom left of the grid and the analysis will appear in the analysis window next to the waveform window.



Click to enlarge

18. Click on the save button to save your measurements. You don't need to choose a name here, since we left the session name at the default date and time stamp earlier.

You can load any template from the Favorites screen by clicking on the Favorites button, or from the Library tab located to the left of the displays. Read the topics below for more information:

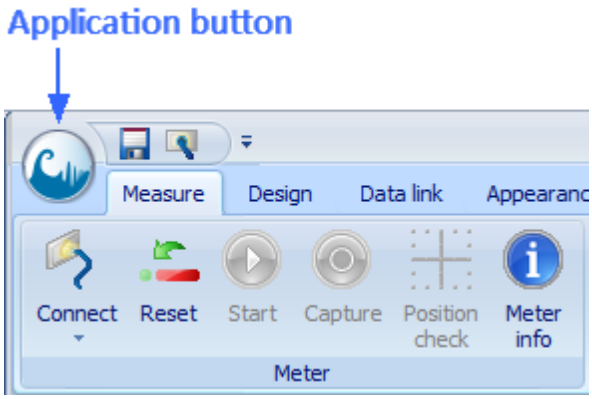
- How to start a new session - read the topic Start a new session
- How to design a test template - read the topic Design a test template
- How to design a checklist template - read the topic Design a checklist template
- How to design a session template - read the topic Design a session template

Chapter 2

Application menu

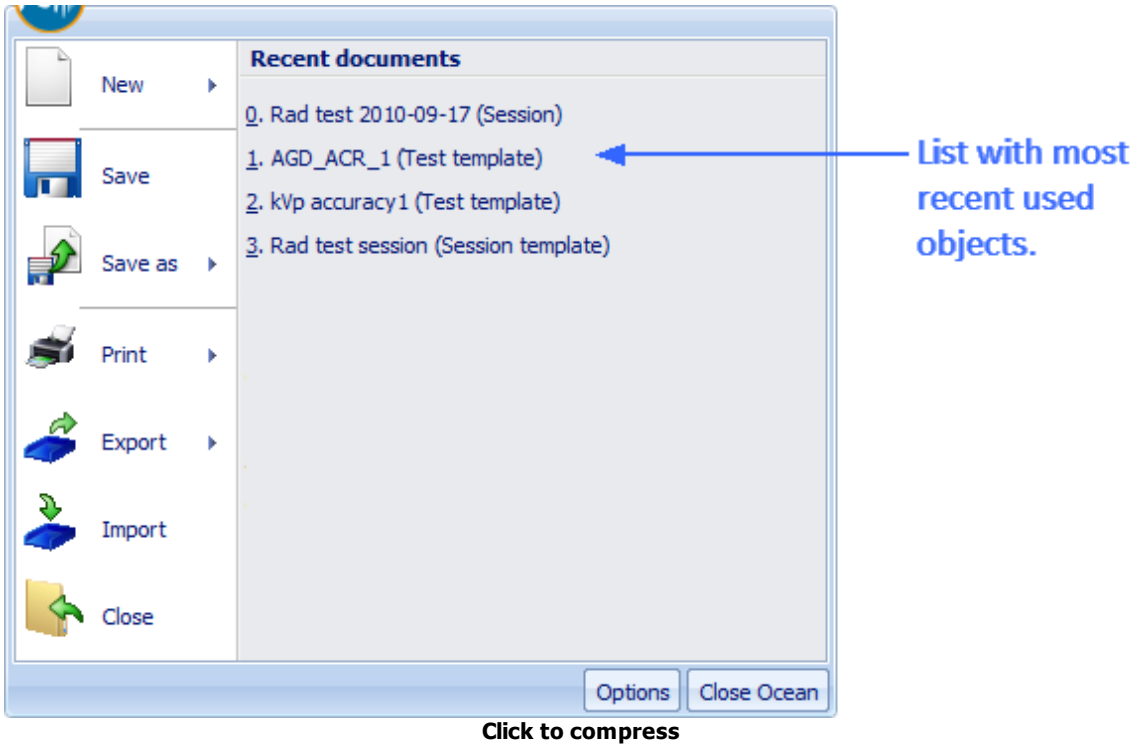
2 Application menu

You can access the Application menu by clicking on the Application button (see picture below) located at the upper left corner of the Ribbon bar.



Click to compress

The Application menu offers quick, convenient access to the most frequently used commands such as New, Save, Import, Export, etc. and the most recently used files (see the picture below).



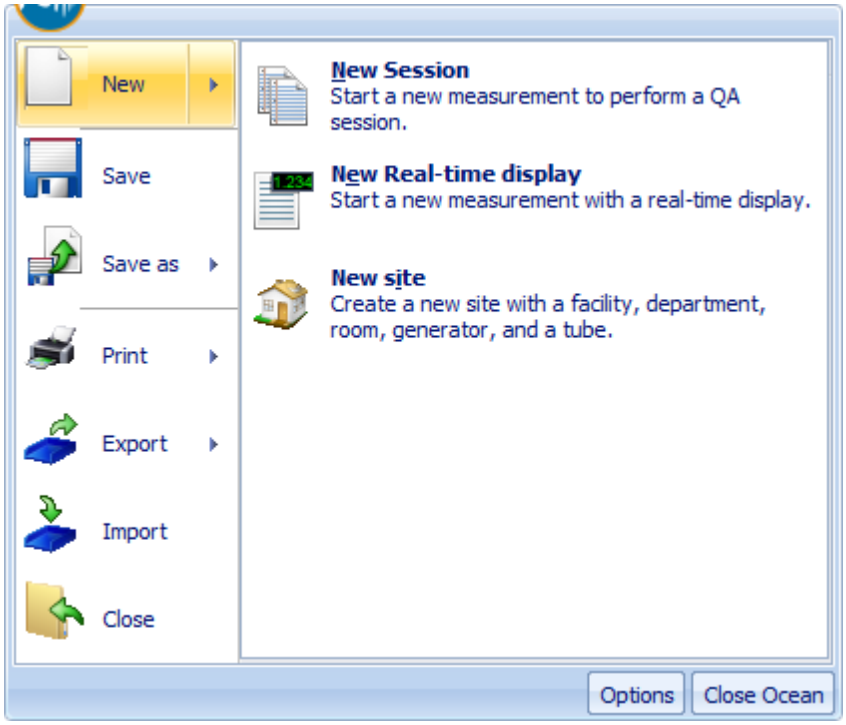
Click to compress

You will find the following functions on the Application menu:

New	Start a new session, real-time display or site
Save	Save what you currently is working with
Save as	Make a template of the current job or rename existing objects
Print	Print current job
Export	Export sessions, tests, checklists or real-time displays to a file (use this to share data with others)
Import	Import sessions, tests, checklists or real-time displays from a file (use this to receive data from others)
Close	Close current job

2.1 New

The **Save** function is located on the Application button drop-down menu. You can use **New** three ways:



Click to compress

New Session - Start a new QA session

Use this function when you want to start a new QA session for a certain room. The new session wizard will appear and will help you create the session. The wizard will ask you to:

- Select the facility, the department and the room where you perform your job
- Select the session template you want to use
- Specify your name and your organization (data from setup is used as defaults)
- Specify a name for your job (the name used when the job is saved in the database)

When the wizard finishes the session is created saved under the **Measurements** tab for the new room you just created.

Read more here...

New Real-time display - Start a new real time display

Use this function when you want to start making measurements with a new real-time display. The

real-time display wizard will appear and will help you create the real-time display. The wizard will ask you if you want to use an existing real-time display template or create a new real-time display from scratch. If you chose to create a new real-time display, the wizard will ask you to:

- Select modality
- Select displays, detectors and calibrations
- Specify where you have connected the detectors (only for Barracuda)

Once the wizard finished, you can start making measurements right away if your meter is connected to the computer. The data from each exposure is shown in the displays and stored in the table. A new row is automatically created in the log for every new exposure (if the cursor is located on the last row). If you need to change meter settings use the **Meter Adjust** function to the right in the main window.

New Site - Create a new site (facility/department/room/generator/tube)

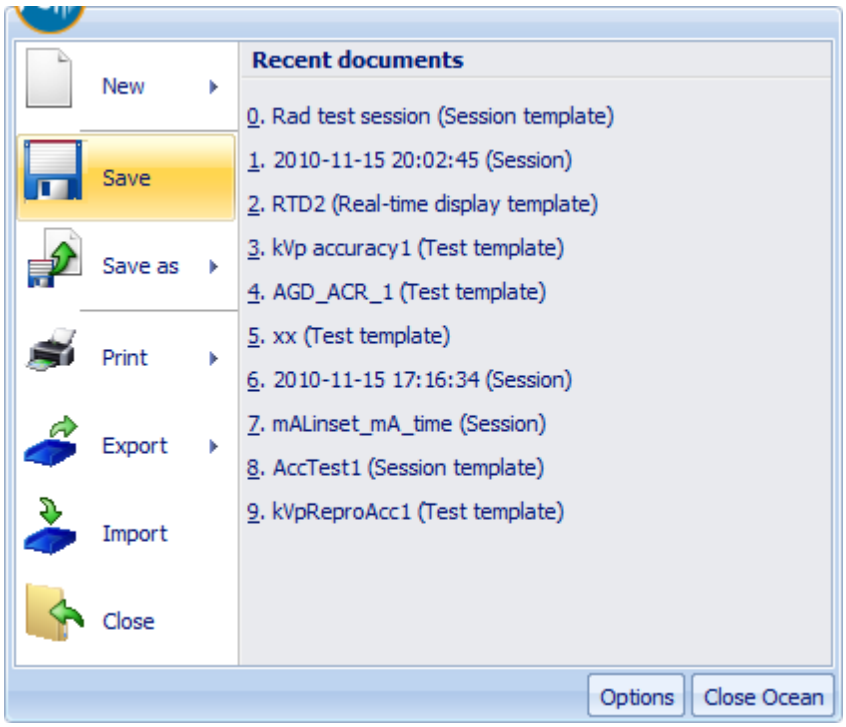
Use this function when you want to add a new site. The new site wizard will appear and will help you add the new site. The wizard will ask you to:

- Specify a facility (name, address, phone number, contact person, etc.).
- Specify a department (name, etc.).
- Specify a room (name, room ID etc.).
- Specify a generator (name, manufacturer, model, serial number, etc.).
- Specify a tube (name, manufacturer, serial number, etc.)

When the wizard finishes, you will be able to view your new site under the **Measurements** tab. The generator and tube is located under the **Equipment** tab.

2.2 Save

The **Save** function is located on the Application button drop-down menu. You can use this to save your current work. What is saved depends on what you are working on at the time you press **Save**.



Click to compress

Working with an opened session

When you press **Save** you the session is saved with the measured data to the same location and name. It is not possible to change the location of the session using this function. If you want to change the location, you must first close the session and then move it by using the drag-and-drop feature of the database tree. If you want to save the session as a template (no measured data) use **Save as** function.

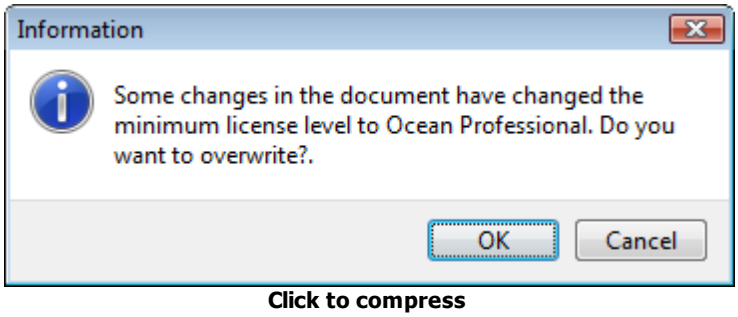
Working with a real-time display

When you press **Save** the real-time display is saved to the same location and name under the **Measurements** tab. You will be asked to choose a name and location if this is the first time the real-time display is saved. It is not possible to change the location of the real-time display using this function. If you want to change the name and/or location, you must first close the real-time display and then move it by using the drag-and-drop feature of the database tree. If you want to save the real-time display as a template (no measured data) use **Save as** function.

Working with a template

When you press **Save** the template is saved (no measured data). You will be asked to specify a name and location if it is a new template. If you want to change the name and/or location, use the **Save as** function.

The following message may be displayed when you go to save your work:


Information
Some changes in the document have changed the minimum license level to Ocean Professional. Do you want to overwrite?.
OK
Cancel

Click to compress

It means that minimum license required to re-open the object changed (became more restrictive). You may see this message if:

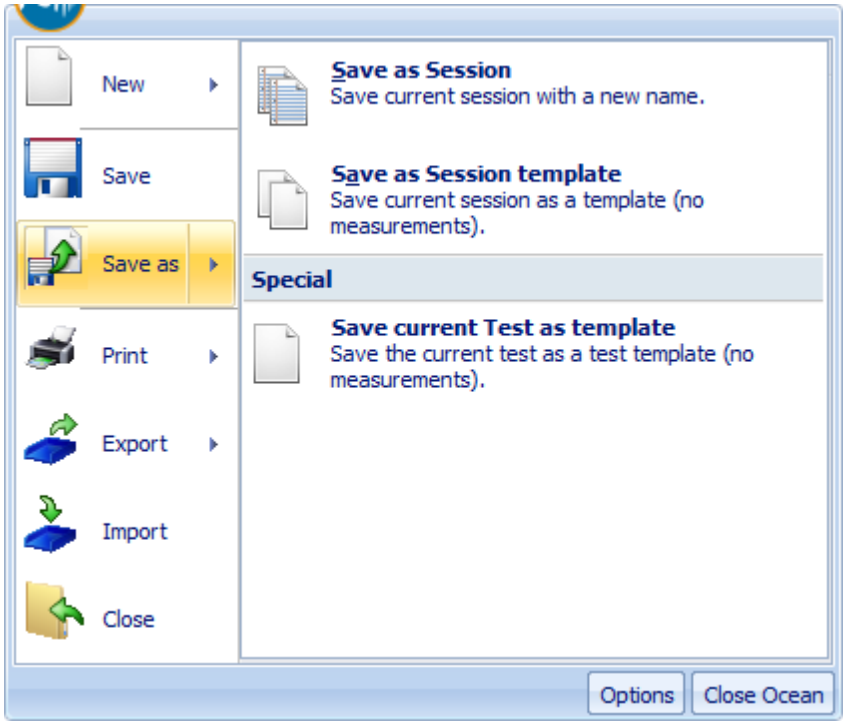
- you use different meters with different Ocean licenses (Display, Connect or Professional) with the same Ocean.
- you start a trial period to test a higher license than you currently have.

2.3 Save as...

The **Save as** function is located on the Application button drop-down menu. You can use this function to do the following:

- Rename an object (real-time display, session or a template).
- Change the location of an object (not for sessions).
- Change the object type (toggle between template and measurement types). For example, you can use this function if you have a session that you wish to make into a template, or vice versa.
- You have the option of saving a test or checklist as a separate object to be included in your future sessions.

Save as functions available while working with sessions



Click to decompress

Save as a Session

If you use Save as to rename a session, it will create a copy of the existing session and all future work will be saved in the new copy. The new copy will be saved in the same site and room where the original session was located. It is not possible to change the location of the new copy using this function. If you want to change the new copy location, you must first close the session and then move it by using the drag-and-drop feature of the database tree.

Important: Please make every effort to save the session to the correct site and room, before you use it. Once a session is used in a certain room and on a certain tube, the equipment information is stored in Ocean and when you move it to a new room, the equipment information from the old room will be moved to the new room as well. This can cause significant problems for you, as no two rooms of equipment is identical. The room and equipment data is used by Ocean to determine what measurements are available to you and, as a result, you may not be able to use certain tests in the session and the test results that you get on other tests may not be accurate.

Save as Session template

You can use Save as Session template if you want to rename an existing template or if you have a session open that you are working on, you can use this function to save it as a template in the **Library**.

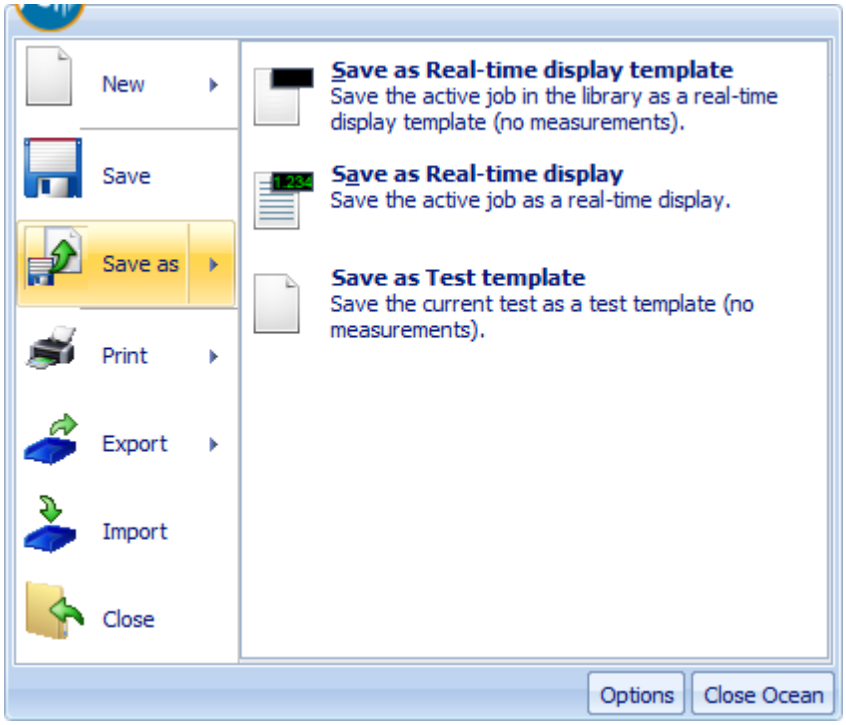
Save current Test as template

You can use Save current Test as template if you want to pick out one individual test of a session or session template and save it for future use as a test template in the **Library**. You can then use this test template in other session templates as well.

Save current Checklist as template

You can use Save current Checklist as template if you want to pick out one individual checklist of a session or session template and save it for future use as a checklist template in the **Library**. You can then use this test template in other session templates as well.

Save as functions available while working with real-time displays



Click to compress

Save as a Real-time display
If you use Save as a Real-time display to rename and/or change the location of a real-time display, it will create a copy of the existing real-time display with all of its measured data and all future work will be saved in the new copy.

Save as a Real-time display template
You can use this in two different situations:

- If you use Save as a Real-time display template to rename and/or change the location of a real-time display template, it will create a copy of the existing real-time display template (without measured data) and all future work will be saved in the new copy at the location you chose.
- You can also use this function if you are making measurements in a real-time display and want to save the real-time display you are working on as a template (no measured data) in the **Library**. All further work will be saved as a real-time display template (no measured data) in the new copy.

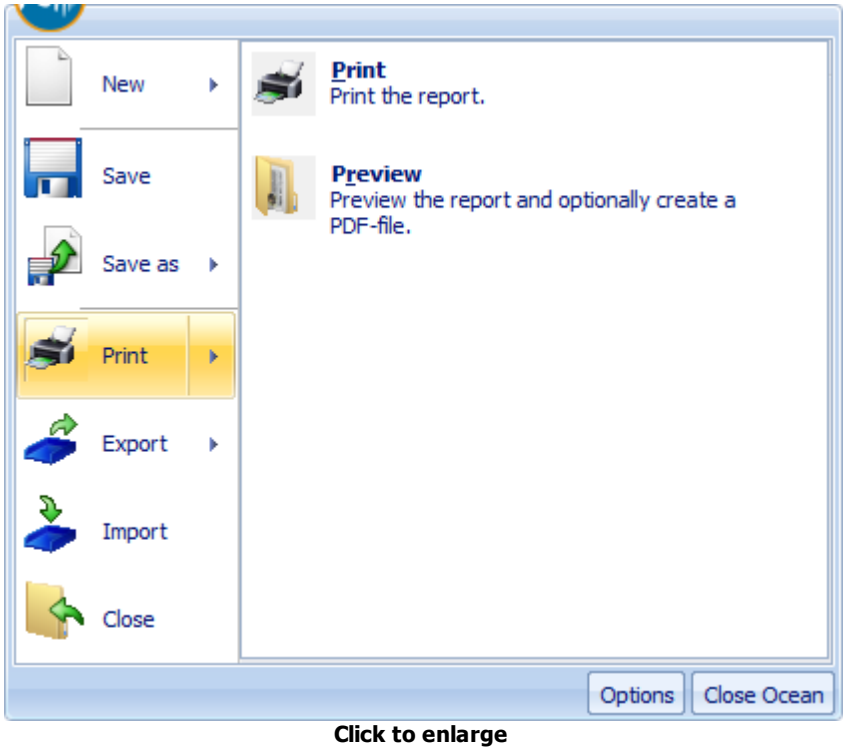
Save as a Test template
You can use Save as a Test template to convert a real-time display to a test template and save it in the **Library**. Any measured data will not be saved and future work will be saved in the test template.

Save as function while in Design mode

Use Save as if you want to rename or change the location of a template you are working on currently.

2.4 Print

This function is used to **print** your current work. You can print on a printer or create PDF files.



Click to enlarge

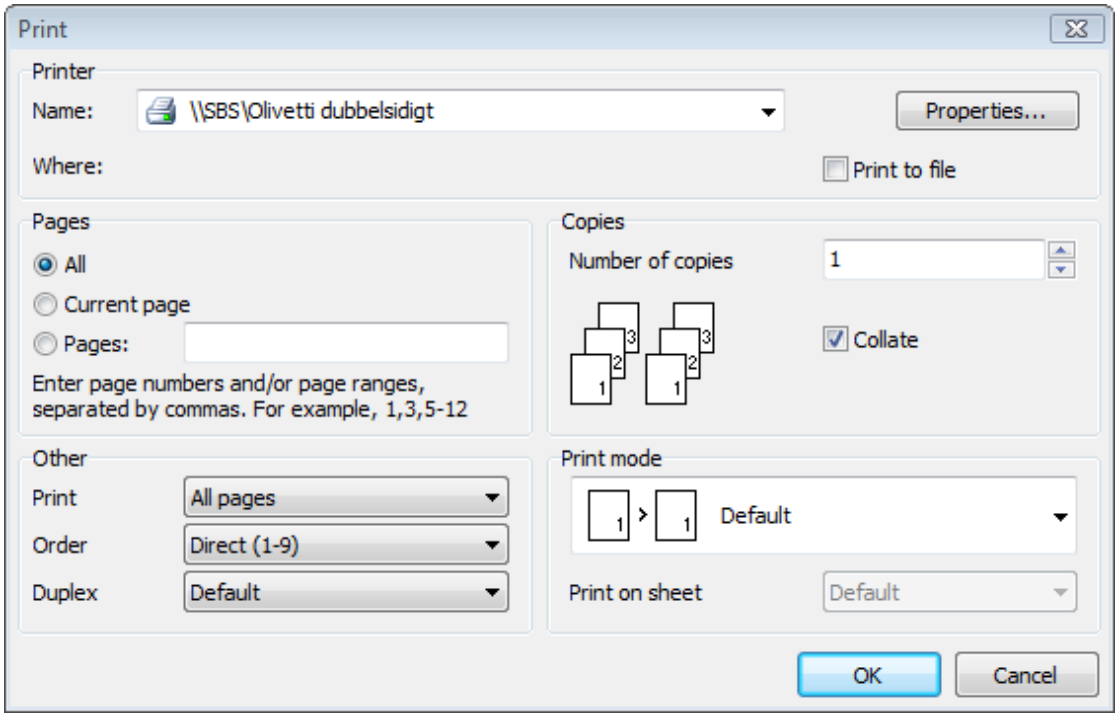
You can print or preview the following:

- Complete reports - if you are working with a session, the complete session is printed/previewed complete with a cover sheet, including all tests (with waveforms if so chosen) and checklists.
- Real-time display - the real-time display currently open in Ocean is printed.
- A test or a checklist during design work - we added this feature to allow you to print out the templates you are working with during design.

NOTE: You can only print or preview one item at a time.

Print

It is important to remember that this function prints the current session/template you are working on and is open in Ocean. The print dialogue (see picture below) is shown when you choose the print function from the drop-down menu on the Application button:



Click to compress

You can select the following:

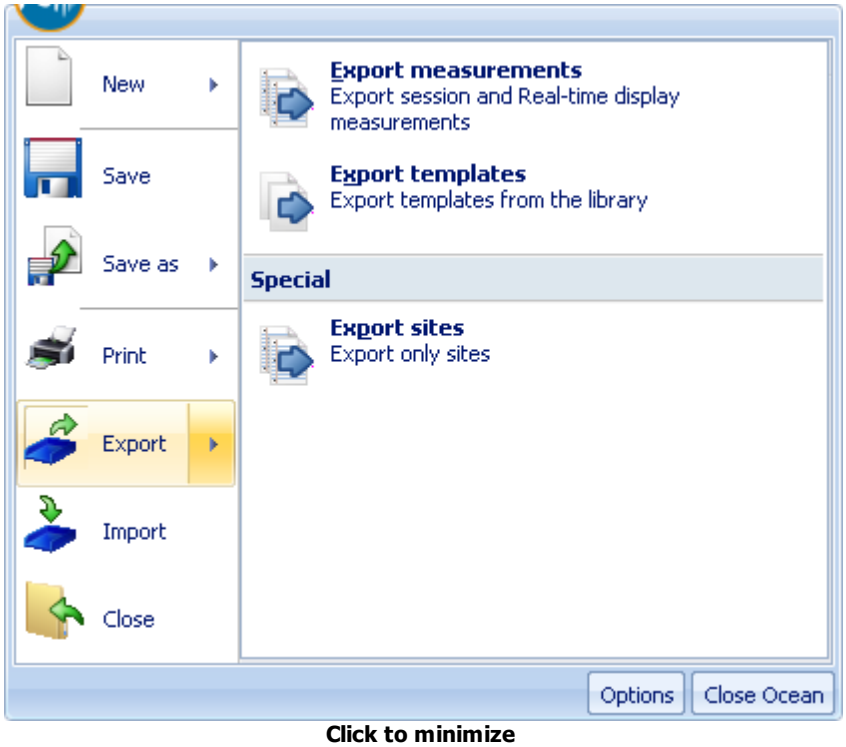
- the printer you want to use and set its properties
- which pages to print
- number of copies

Preview

The preview function can be found by hovering your mouse cursor over the print function in the drop-down menu on the Application button. Choose the preview option if you want to check your work before printing. You are able to print directly from the preview window, or you do have the option to store your work in a PDF file. If you choose to create a PDF file, a file save dialogue is shown, allowing you to give a name to your work and to specify a destination anywhere on your computer, network or mobile media.

2.5 Export

This function is used **export** items (sessions, real-time displays and templates) to an external file or via e-mail as an attachment. The export and import functions enable you to easily share your work with your colleagues and regulatory authorities.



Click to minimize

There are three types of Ocean data you can export:

1. Measurements - (.ome) files
2. Templates - (.ote) files
3. Sites - (.ome) files

The files are identified by the following icons:



Exporting measurements

Use this type of export when you want to export measurements; sessions and real-time displays.

To begin the export process, click on the Application button, then hover the mouse over the export function from the drop-down menu (see picture above). You will be offered three choices (export measurements, export templates and export sites). To export measurements, follow the two easy steps as described below:

Step #1

When you select the "Export measurements" option a wizard starts automatically to allow you to select the items you want to export. Select all items you wish to export. You can select individual measurements or right click on a folder and select "Export...". In the later case, all measurements in that folder and below will be selected for export. Click on the Next button to continue.

Step #2

Once your selection is made, the next screen will offer you a choice between creating a file only, or send the export directly to another Ocean user as an e-mail attachment. You can also add an optional message to your file for the user or regulatory authority to whom you are sending the data. This message will be shown when the user imports the data.

Click Finish when you are ready and the export file will be generated with an ".ome" extension and you will be asked to choose a file name and location to store the file. If you chose the option to send the file via e-mail, your e-mail program will be opened and a blank e-mail started with the ".ome" file added as an attachment. All you have to do now is to complete the e-mail and then send it.

Exporting templates

Use this type of export when you want to export templates; sessions, tests, checklists and real-time displays.

To begin the export process, click on the Application button, then hover the mouse over the export function from the drop-down menu (see picture above). You will be offered three choices (export measurements, export templates and export sites). To export templates, follow the two easy steps as described below:

Step #1

When you select the "Export templates" option a wizard starts automatically to allow you to select the items from your library that will be exported. Select all items you wish to export. You can select individual templates or right click on a folder and select "Export...". In the later case, all templates in that folder and below will be selected for export. Click on the Next button to continue.

Step #2

Once your selection is made, the next screen will offer you a choice between creating a file only, or send the export directly to another Ocean user as an e-mail attachment. You can also add an optional message to your file for the user or regulatory authority to whom you are sending the data. This message will be shown when the user imports the data.

Click Finish when you are ready and the export file will be generated with an ".ote" extension and you will be asked to choose a file name and location to store the file. If you chose the option to send the file via e-mail, your e-mail program will be opened and a blank e-mail started with the ".ote" file added as an attachment. All you have to do now is to complete the e-mail and then send it.

Exporting sites

Use this type of export when you want to export sites. It exports all site information (facility, departments, rooms and all equipment).

To begin the export process, click on the Application button, then hover the mouse over the export function from the drop-down menu (see picture above). You will be offered three choices (export measurements, export templates and export sites). To export sites, follow the two easy steps as described below:

Step #1

When you select the "Export sites" option a wizard starts automatically to allow you to select the facilities. Select all items you wish to export. Click on the Next button to continue.

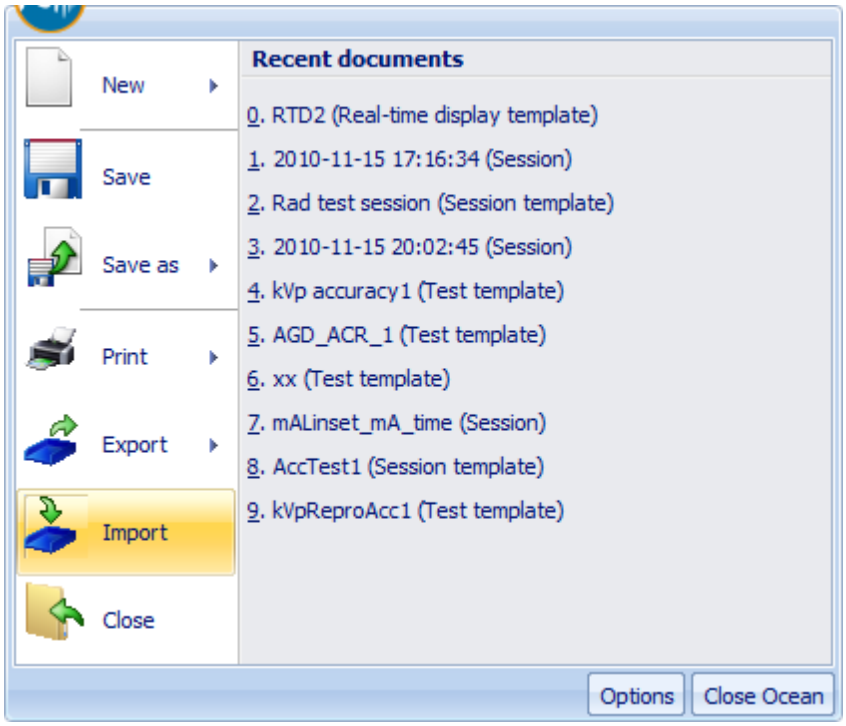
Step #2

Once your selection is made, the next screen will offer you a choice between creating a file only, or send the export directly to another Ocean user as an e-mail attachment. You can also add an optional message to your file for the user or regulatory authority to whom you are sending the data. This message will be shown when the user imports the data.

Click Finish when you are ready and the export file will be generated with an ".ome" extension and you will be asked to choose a file name and location to store the file. If you chose the option to send the file via e-mail, your e-mail program will be opened and a blank e-mail started with the ".ome" file added as an attachment. All you have to do now is to complete the e-mail and then send it.

2.6 Import

We added the **Import** function to give you the opportunity to share your work with other Ocean users. This is especially helpful in large organizations where more than one person is working on equipment at a site. To begin the import process, click on the Application button, then select the import function from the drop-down menu (see picture below):



Click to minimize

Import from the Application menu

After you selected Import, a dialogue box will appear to help you select the files you want to import. If you wish to exclude certain files from the import, just uncheck the item by clicking on the checkbox in front of the item. There are two types of Ocean files you can import:

(.ome) files -- these are the measurements



(.ote) files -- these are the templates



Once you made your selection, click Open. A new dialogue box is now shown with the number of items selected for import, the file type (such as session or real-time display) and the destination path.

When you finished making the choices for import, click the Finish button to complete the process.

Import directly from Windows

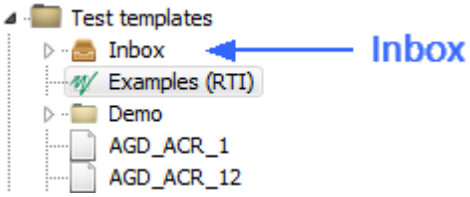
You can now import a file directly from Windows by double-clicking on the file. For this example, let's assume that we have a file with measurements or templates on the desktop:



When we double-click on the file icon, Ocean will start up and will automatically begin the import process.

Destination

- The **templates** are imported into the "templates" inbox and **real-time displays** are imported into the "real-time display" inbox.

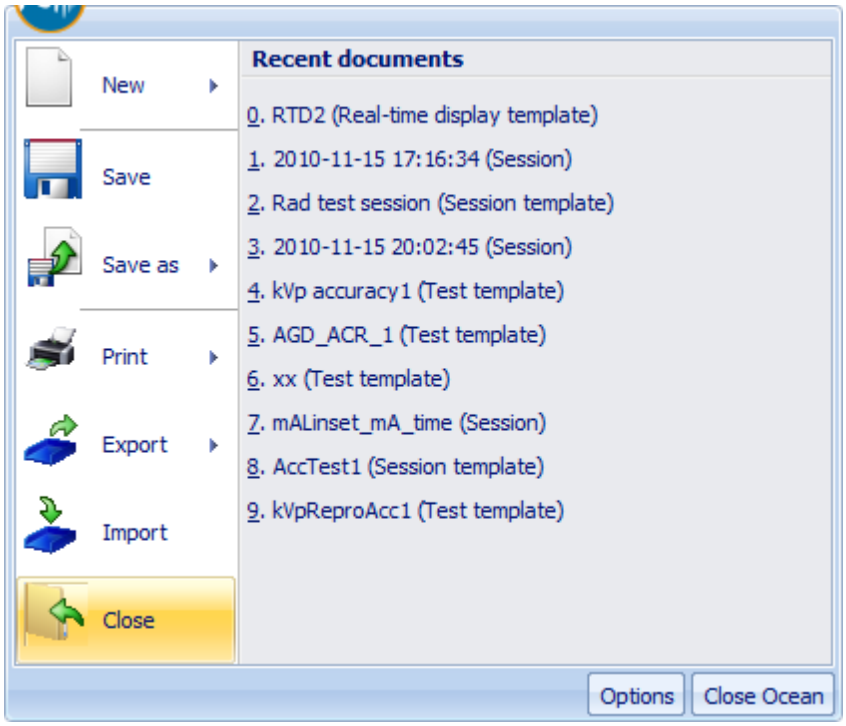


- **Sessions** are imported into the facility/department/room they belong to. If the site doesn't exist on our computer, Ocean will give the choice to create the site or skip the item from the import list.

2.7 Close

Click on this button if you want close what you currently are working with.

NOTE: The Close button will only close the current job you are working on but it will not exit Ocean.

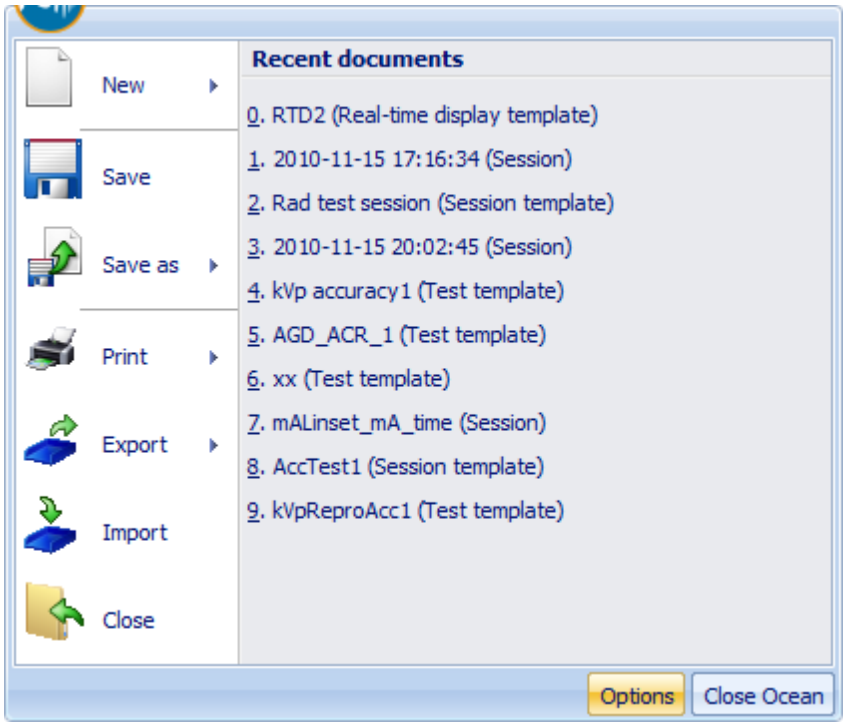


Click to compress

If you have unsaved work while trying to close the current task, you will be given the choice to save and then close.

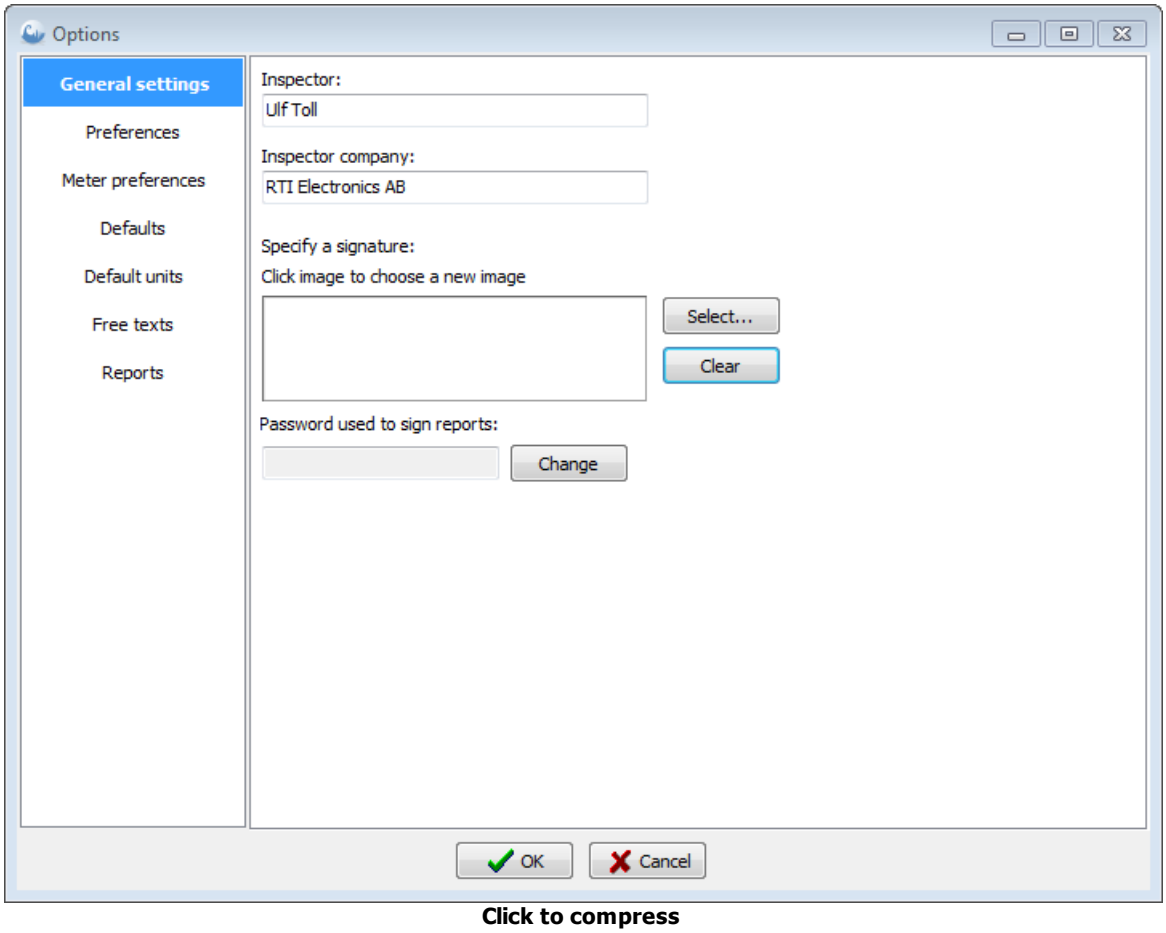
2.8 Program options

The program options menu contains settings that control how Ocean works. This menu is available as a button called "Options" located on the bottom right of the **Application menu**.



Click to compress

Click on the button to open the Program options:



Click to compress

The following four sections are found under the Options button:

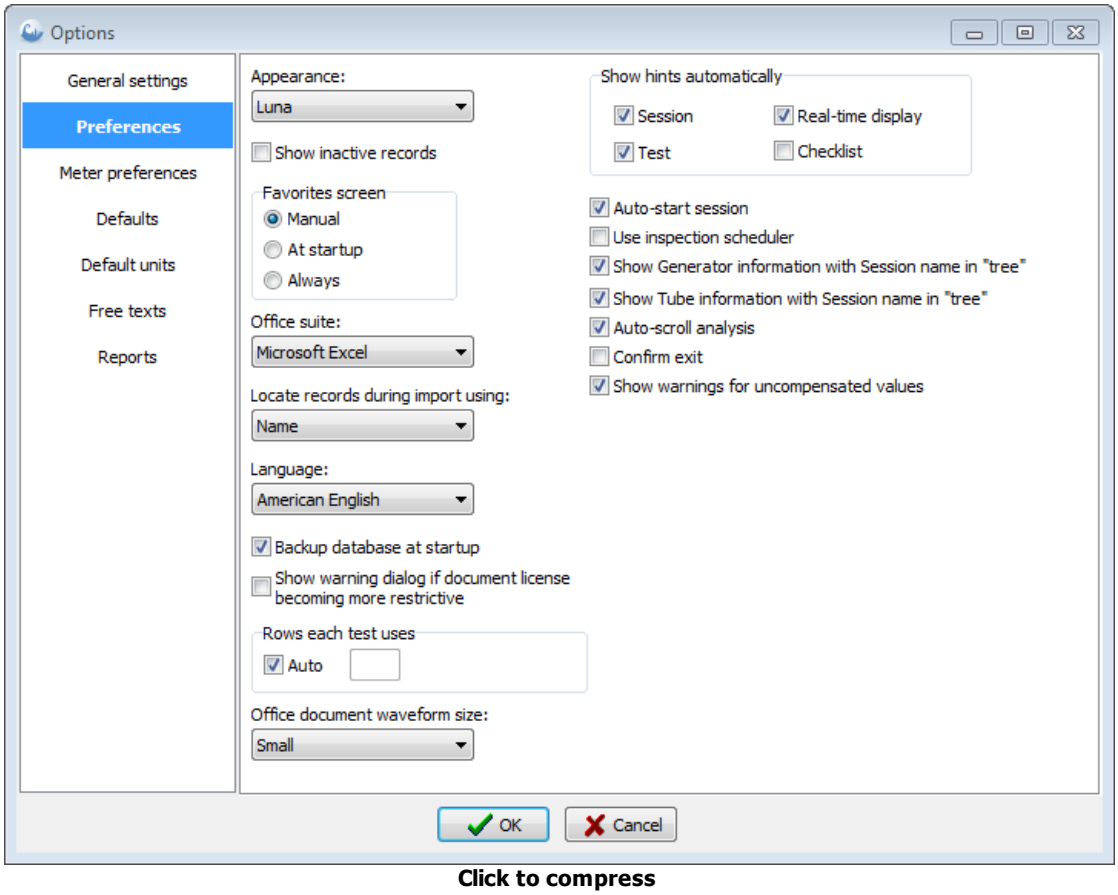
General settings

These are global setting stored in Ocean.

Inspector	This is where you change the inspector name in Ocean. This name will appear as the inspector name when working on a session.
Company	This is where you change the company name the inspector works for.
Specify signature	This is a pciture of your signature that can be added to the summary page of the report when you sign the report.
Password used to sign the report	This password must be specified to be able to sign and close a report.

Preferences - The settings below are user-chosen preferences to customize Ocean.

The settings listed here control how Ocean works.



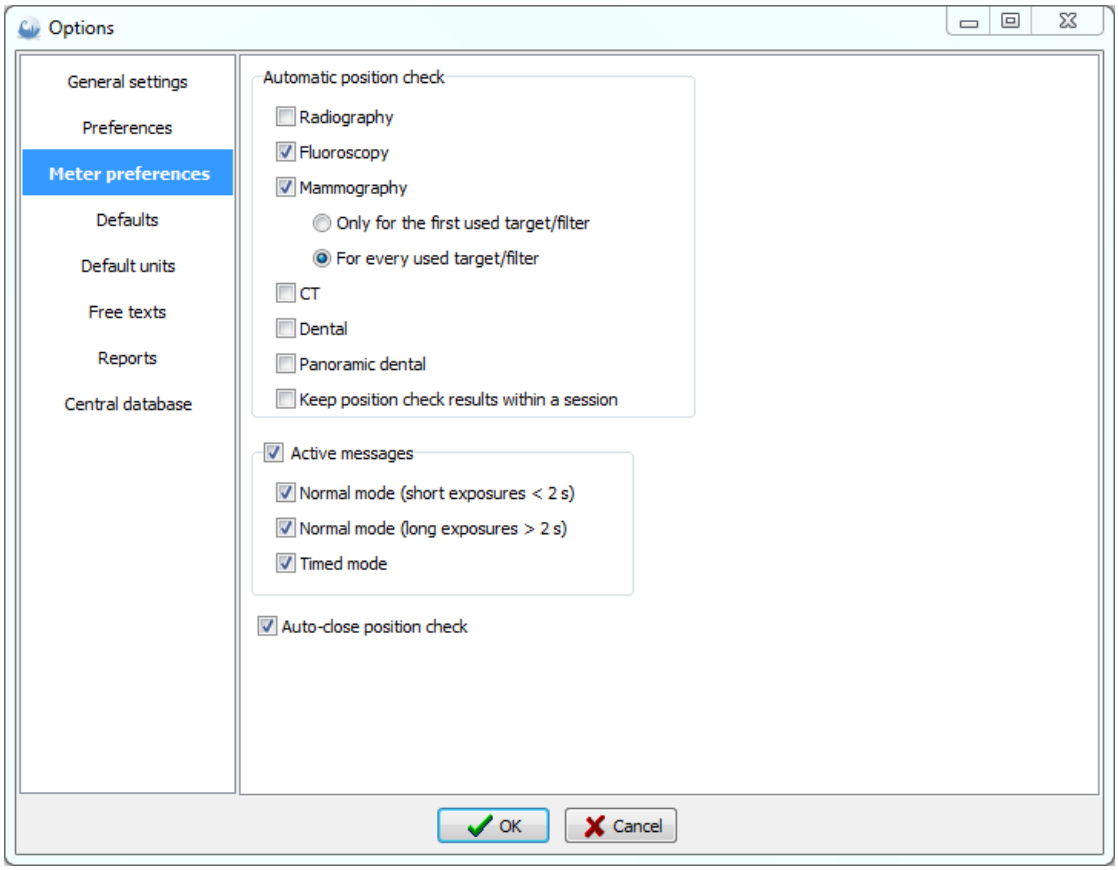
Click to compress

Appearance	Select the color scheme for Ocean (Luna is recommended).
Show inactive records	The default is checked. If unchecked, items set to "inactive" in the database are not shown.
Favorites screen	Defines when the user wants to see the Favorites list. Three choices are available: always, only at start up) or only when the Favorites button is clicked.
Office suite	User selection to use Microsoft Excel or OpenOffice Calc with the Connect and Professional license levels.
Locate records during import using	User selection to locate items by "Name" or by "ID". Default is that items are located by "Name".
Language	Select language (only American English is presently available).
Backup of database at start up	If this box is checked, a back-up of the databse will be performed every time you start Ocean.
Show warning dialog if document license becoming more restrictive	A message is shown when saving a document if the required license level to open it again, is raised.
Rows each test uses	Space allocated for each test when a complete session is dumped to Excel or Calc.
Office document waveform size	Select size for waveform pictures that are exported to Excel or Calc.
Show hints automatically	If this is checked, hints are shown automatically.
Auto start session	If checked, the session starts automatically when it is opened.
Use inspection scheduler	Enable the option to set inspection dates. You will also be reminded to set the next date when you start an inspection.

Show Generator name with session name in the "tree"	Show the generator name with the session name in the room's Measurements folder.
Show Tube information with Session names in the "tree"	Show tube information with the session name in the room's Measurements folder.
Auto-scroll analysis	When a "one row analysis" (AGD, CTDP(helical scan/in phantom), CTDP(helical scan/free-in-air) and QuickHVL) the analysis automatically scrolls to show the analysis.
Confirm exit	Show a dialgue before Ocean closes.
Show warnings for uncompensated values	If checked, a warning is shown if a measured value is not auto compensated. Default value is unchecked.

Meter preferences - The settings below are user-chosen preferences for the meter.

The settings listed here controls the meter.

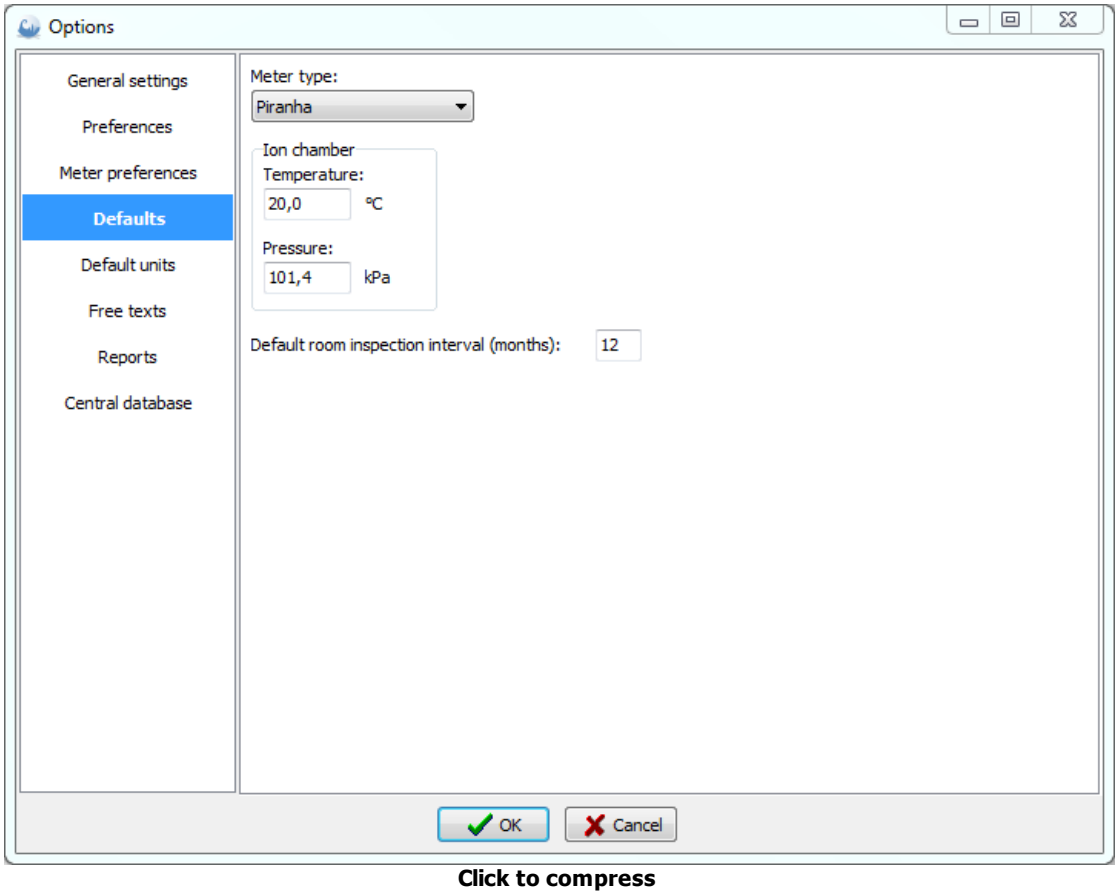


Click to compress

Automatic position check	Defines when user wants to be notified to do a position check.
Active messages	If checked, active messages will be displayed for each measuring mode.
Auto-close position check	If checked, position check closes automatically when it is successful.

Defaults - These settings control functions within Ocean related to measurements and templates

These are the settings that will be the defaults related to measurements.



Click to compress

Meter type This is used when you work off-line during template design. You can select "Piranha" or "Barracuda". You can use a template designed for a Piranha with a Barracuda and vice versa. The only requirement for connecting to a meter is that the meter have an Ocean license.

Temperature Reference temperature used when calculating the TP-factor for ion chambers.

Pressure Reference pressure used when calculating the TP-factor for ion chambers.

Default inspection interval Default inspection interval (months) for room.

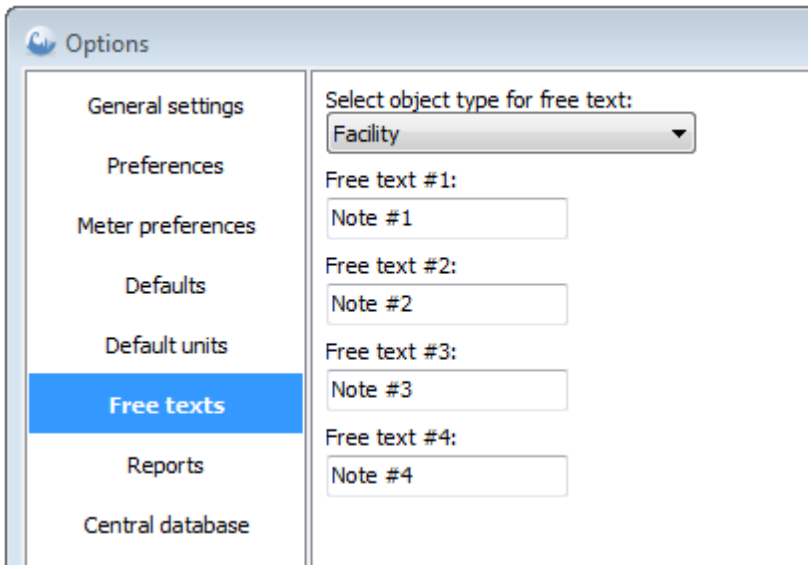
Default units - These settings control functions within Ocean related to measurements and templates

These are the default units, they can be changed "locally" in each template.

Units This is where you can define the default units you want to work with. The choice you make here will affect all new ttemplates you design, but you can change them any time.

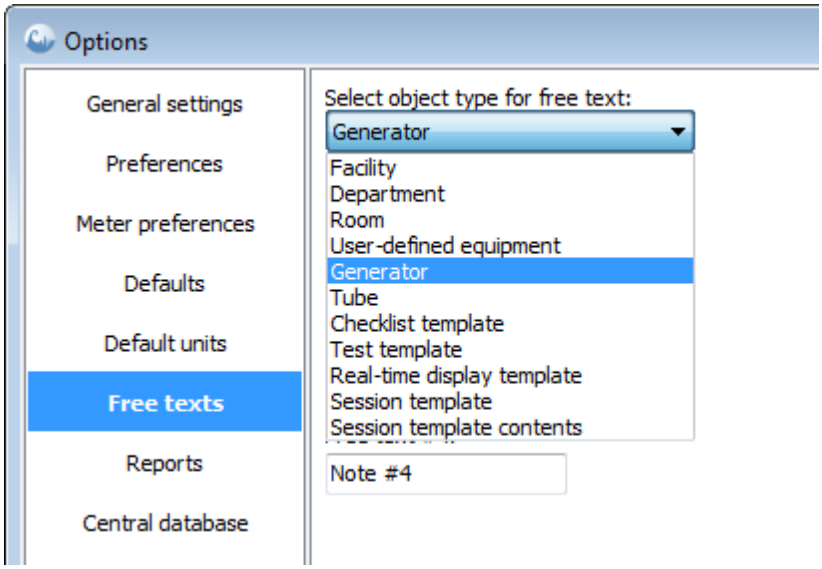
Free texts - Edit user-defined labels

Here is it possible to specify the user-defined labels that are available for facility, department, room, generator, tube, user-defined equipment and all type of templates.



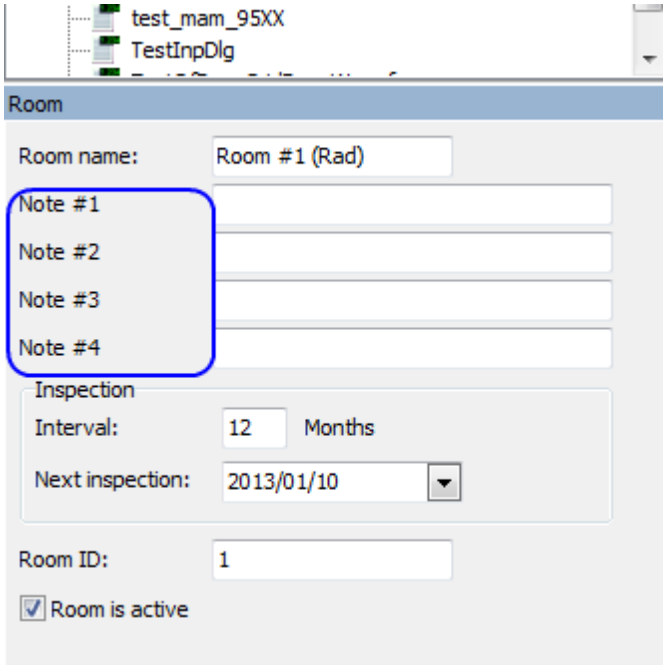
Click to minimize

First select object type and then edit the free texts.



Click to minimize

The free texts are labels for the user-defined fields that are available for all site objects:

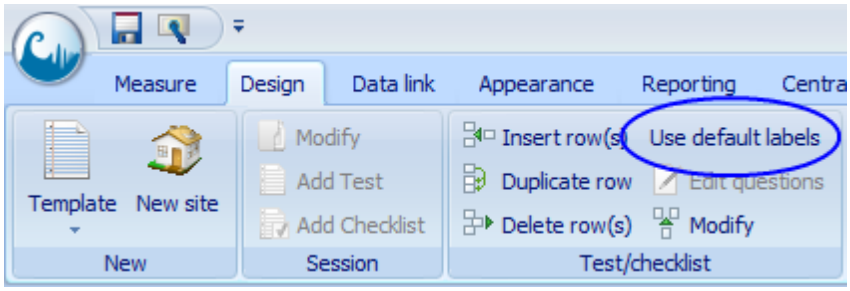


Click to minimize

These fields are also shown in the report and can be used to specify user-defined data.

If you change the labels here it only affects the default labels that are used when you create new templates. If you want to use the new labels in already existing templates do the following:

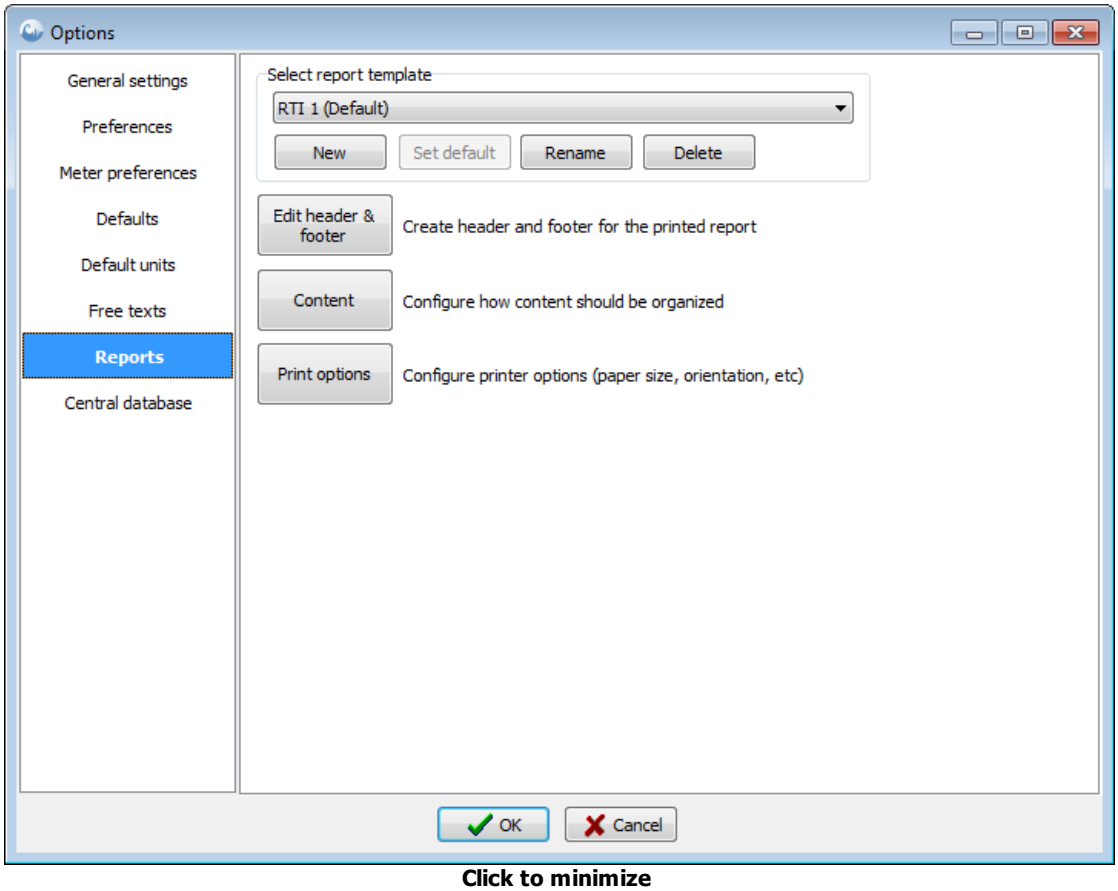
1. Go to the design page.
2. Click on "Use default labels".



Click to minimize

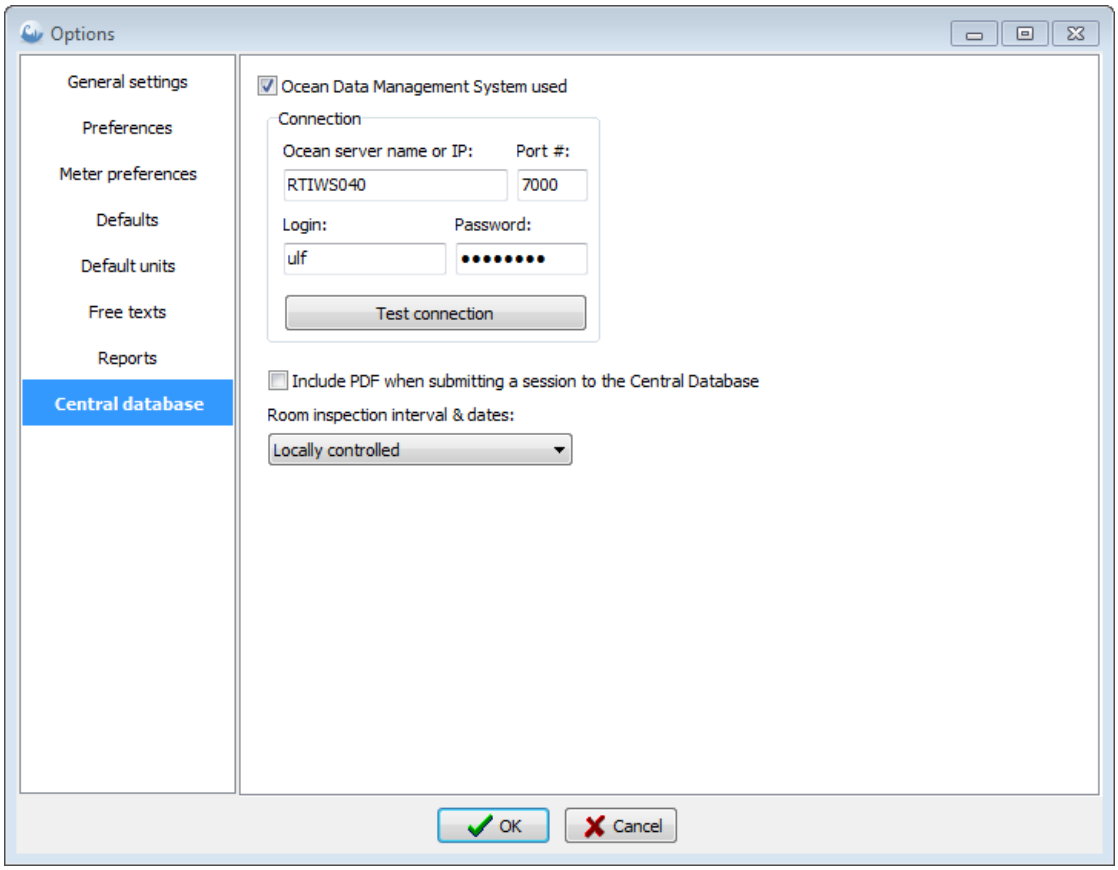
Reports - Define different templates for the report

Here is it possible to define individual header and footer for cover page and test pages, content and print options. It is possible to use standard texts, user-defined texts and pictures (for example a logo). One report template can be set as "default" and will automatically be used when new session templates are created. Different report templates can be created and you can quickly chose between them when you create your report.



Click to minimize

Central database - Settings if you are going to connect to a central database



Click to minimize

You will get instructions from the system administrator for Ocean Central how to set these parameters if this option is used.

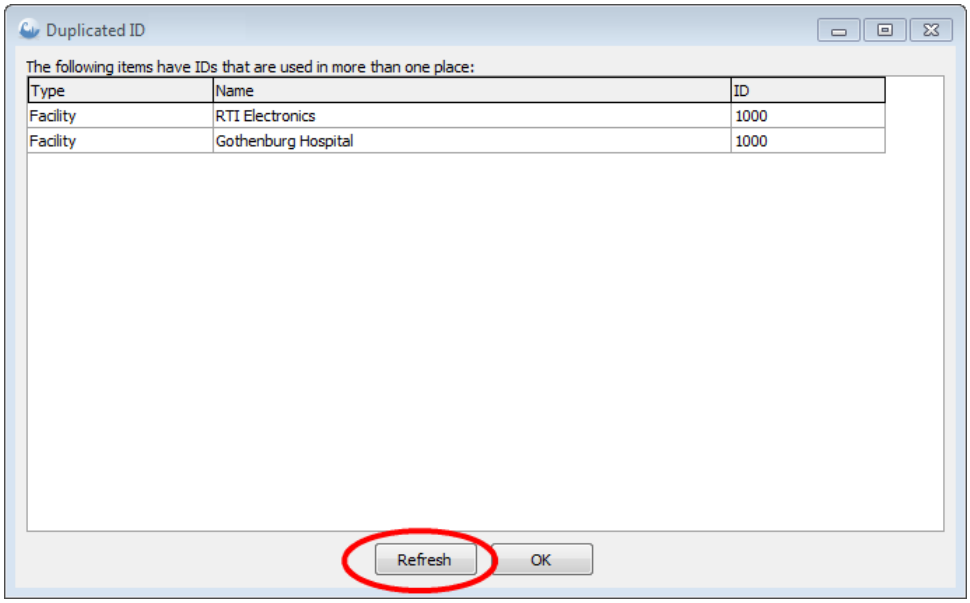
2.9 Locate data during import and export

There are two ways to locate session data when export and import is used between different users. This is applicable both the the standard import/export function when e-mail is used and when Ocean Central is used. Location of data can be done with "Name" or "ID". Measured session are organized based on the site information (facility, department and room). The session also includes information about tested equipment (generator, tube and any user-defined equipment). All these items are recognized either by its name or by an ID it has been given. The default way to locate data is by Name. If you want more data integrity you may use ID instead. In this case must a all items (facilities, departments, rooms and all equipment) that are used have an ID specified. This ID is then used to decided where data goes when it is imported/exported.

If you want to use ID instead of name, go to the Preference page in the Program Options and select ID.

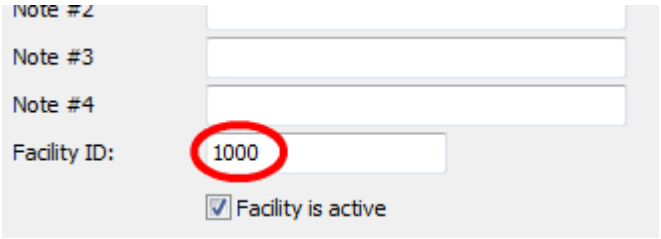
ID can be any text string and it must for each level be unique (all facilities must have a unique ID, all departments within a facility must have unique ID, and so on). If ID is selected the uniqueness is checked every time you click on the button "Check IDs" on the Design page of the ribbon bar.

If there are duplicated IDs the following is shown:



Click to enlarge

All duplicated IDs will be shown. You can double-click on a row and the corresponding ID will be located and you can modify it:

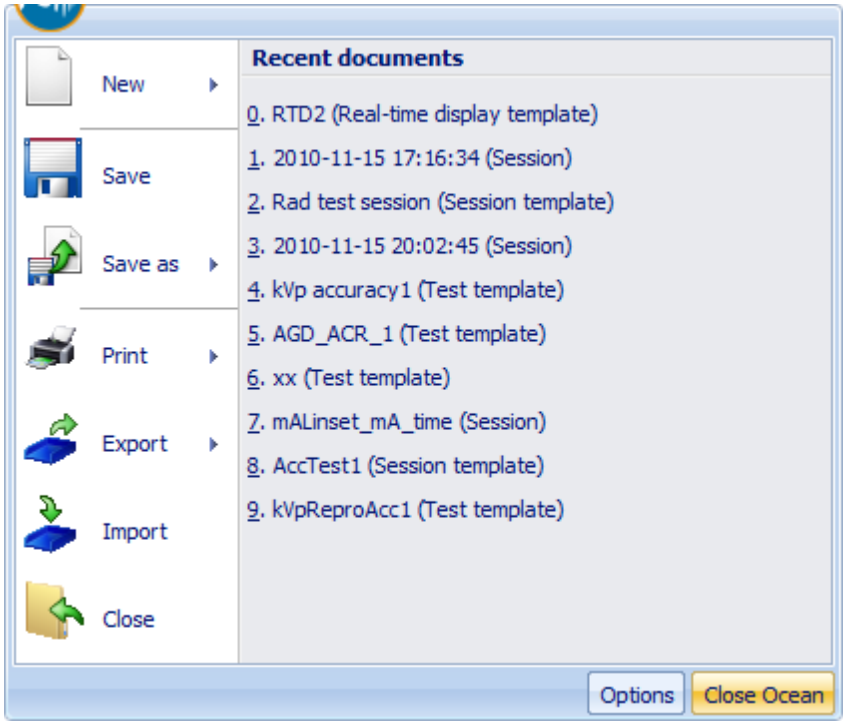


Modify the ID and click on the Refresh button to update the list.

2.10 Exit Ocean

To exit Ocean, simply click on the Application button and then choose the Close Ocean button located on the bottom right of the Application menu.

NOTE: The Close button in the Application menu and on the Ribbon bar will only close the current job you are working on but it will not exit Ocean.



Click to compress

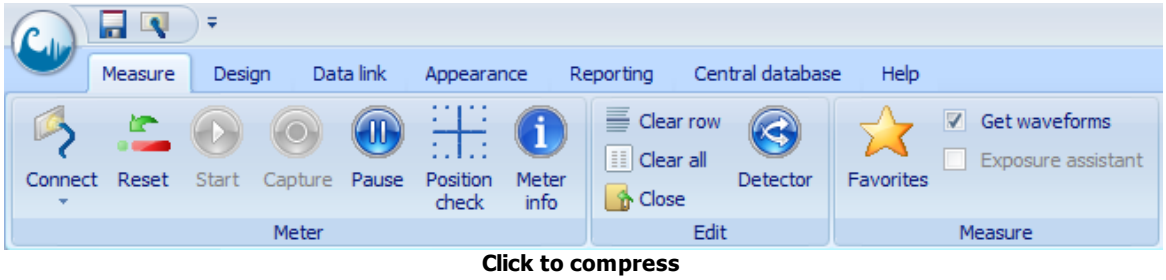
If you have unsaved work while trying to exit Ocean, you will be given the choice to save and then exit.

Chapter 3

Main functions

3 Main functions

In this topic the main functions on the Ribbon are described.



Click to compress

The main functions are:

Measure	Functions you need when you do measurements
Design	Functions you need when you create or modify templates
Data link	Functions you need when you use Ocean with Microsoft Excel or OpenOffice Calc
Appearance	Functions you need when you want to change how things appear on the screen
Reporting	Functions you need for reporting
Central Database	Functions you need when you are connected to a central database
Help	Here you will find help on how to use Ocean topic by topic

Many of the functions are also available via a "right-click" with your mouse. Simply right-click on an object and a menu will be shown with the functions available to you.

3.1 Measure

Most of the functions you will need when you make measurements are located on the Measure tab of the Ribbon bar. There are three groups of functions you will need to know about: Meter functions, Editing functions and Measure functions. See below a more detailed discussion on all three groups of functions.

When you are measuring, the lower status bar shows "Log mode".



This indicates that measures data are saved when you click on the save button.

Meter



These are functions related to controlling your instrument. The settings are also available on the Meter adjust tabs on the right of the Ocean Main screen.

NOTE: If you do not own a Piranha or a Barracuda, just ignore the meter adjust tabs.

Connect - This function establishes communication between your instrument and Ocean

Make sure that the meter is connected to the computer (via USB cable or Bluetooth).

You can toggle between *Keyboard* and *Connected* by clicking on the upper part of the button. With *Keyboard* active you must enter all measured data by hand via the keyboard. When the meter is connected the measured data is transferred automatically from the meter to the Main screen grid.

If you click on the lower part of the button a third option, *Disconnect*, is available. Use this option only in the event you need to:

- Turn your meter off and then back on again.
- If you need to restart meter communication (for example, if you want to switch from one meter to another one). See also Auto start and auto connect.
- If you want to stop meter communication (for example if another program should use the meter while Ocean still is running).

Note!
It is recommended that you turn off power save mode or sleep mode on your computer while you make your measurements with a meter connected. You may experience problems with meter communication if your computer goes to sleep mode or power save mode automatically.

Reset - Manual reset (zero-adjust)

You click on this button when you need to reset the meter. This is normally done automatically but you may have to do it manually in certain situations, for example:

- When you measure at very low signals and use "Free run" measuring mode.
- When you switch detectors after a test is already loaded and the meter is prepared for an exposure (this is relevant only for Barracuda).
- When you suspect that the meter, for some reason, measured an incorrect zero-level.

Start - Start measuring manually

This button is used in **Free run** and **Timed mode** to start the measuring sequence.

Capture - Click this button to capture a value manually

You can use this button during long measuring sequences (for example when testing a fluoroscopy unit) to capture the data at a time of you choosing. For example, you may wish to wait until the data is stable before capturing a value. You must always use this button to capture the measured data when **Free run** mode is used.

The waveform is also captured at the same time as you click on this button (if the checkbox **Get waveform** is checked). Note - free run mode doesn't provide a waveform.

Pause - Pause measurement

This button is used if you don't want the meter to measure even if the detector gets radiation or trigger for some other reason. You can use it for example when you use fluoro and the monitor to position a detector on the image intensifier.

Position check - Verify that your kVp detector is positioned correctly

You can use this to verify that the kVp detector is correctly positioned in the X-ray field. It is always recommended to use this function, but it is especially important in the situations described below:

- Whenever you measure on mammography (after every change of target/filter)
- For all small X-ray fields or when there is a risk that the entire detector may not be irradiated (for example CT and dental)
- If the detector is positioned very close to the focus point

The position check results are not stored with the measured data. If you wish to store this value, you can add a special column to your test and the position check results will be saved with the test in a column of its own.

Position check is always initiated automatically for mammography. This function can be turned of in the Program options.

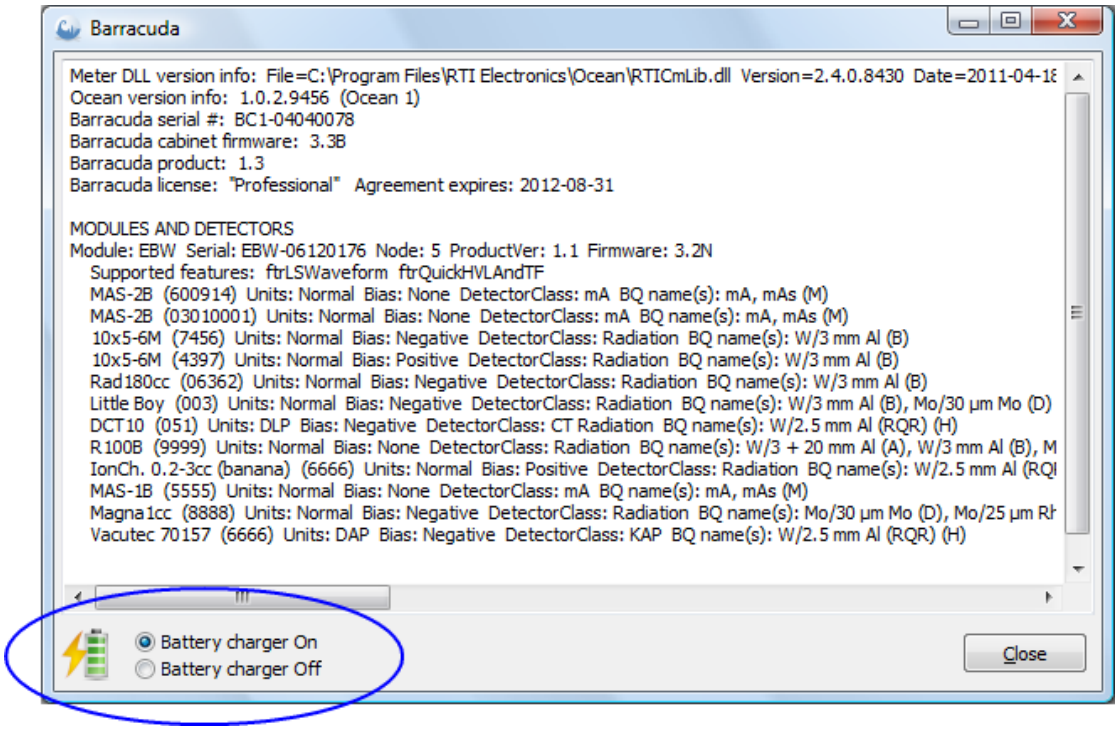
Meter infromation - Get meter information

Click on this button if you want to know more about the connected meter and Ocean. The following information is provided:

- Meter DLL location and version
- Ocean version
- Meter serial number
- Hardware versions
- Model
- Calibrations

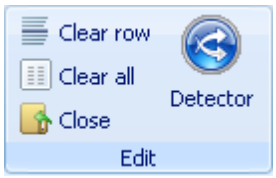
Charging of Barracuda

If you are using Barracuda, charging is turned on and off from this screen:


Barracuda
Meter DLL version info: File=C:\Program Files\RTI Electronics\Ocean\RTICmLib.dll Version=2.4.0.8430 Date=2011-04-18
Ocean version info: 1.0.2.9456 (Ocean 1)
Barracuda serial #: BC1-04040078
Barracuda cabinet firmware: 3.3B
Barracuda product: 1.3
Barracuda license: "Professional" Agreement expires: 2012-08-31
MODULES AND DETECTORS
Module: EBW Serial: EBW-06120176 Node: 5 ProductVer: 1.1 Firmware: 3.2N
Supported features: ftrLSWaveform ftrQuickHVLAndTF
MAS-2B (600914) Units: Normal Bias: None DetectorClass: mA BQ name(s): mA, mAs (M)
MAS-2B (03010001) Units: Normal Bias: None DetectorClass: mA BQ name(s): mA, mAs (M)
10x5-6M (7456) Units: Normal Bias: Negative DetectorClass: Radiation BQ name(s): W/3 mm Al (B)
10x5-6M (4397) Units: Normal Bias: Positive DetectorClass: Radiation BQ name(s): W/3 mm Al (B)
Rad180cc (06362) Units: Normal Bias: Negative DetectorClass: Radiation BQ name(s): W/3 mm Al (B)
Little Boy (003) Units: Normal Bias: Negative DetectorClass: Radiation BQ name(s): W/3 mm Al (B), Mo/30 µm Mo (D)
DCT10 (051) Units: DLP Bias: Negative DetectorClass: CT Radiation BQ name(s): W/2.5 mm Al (RQR) (H)
R100B (9999) Units: Normal Bias: None DetectorClass: Radiation BQ name(s): W/3 + 20 mm Al (A), W/3 mm Al (B), M
IonCh. 0.2-3cc (banana) (6666) Units: Normal Bias: Positive DetectorClass: Radiation BQ name(s): W/2.5 mm Al (RQI
MAS-1B (5555) Units: Normal Bias: None DetectorClass: mA BQ name(s): mA, mAs (M)
Magna1cc (8888) Units: Normal Bias: Negative DetectorClass: Radiation BQ name(s): Mo/30 µm Mo (D), Mo/25 µm Rh
Vacutec 70157 (6666) Units: DAP Bias: Negative DetectorClass: KAP BQ name(s): W/2.5 mm Al (RQR) (H)
Battery charger On
Battery charger Off
Close

Click to compress

Edit



These functions are used for editing the measured data.

Clear row - Clear current row (removes all measured data from current row)

Click on this button if you want to clear the current row. The set values will not be removed with this command.

Clear all - erase all data in the object you are working with (removes all measured data from the entire grid)

Click on this button if you want to clear all the rows. The set values will not be removed with this command.

Close - Close your current work (this command will not close Ocean)

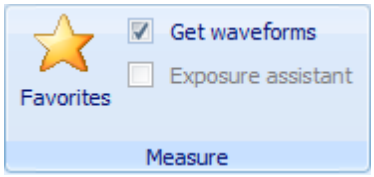
Click on this button if you want close the current job you are working on. You will be prompted to save any unsaved data before closing.

This is the same as **Close** on the **Application menu**.

Detector - Change the detector

Use this button if you want to choose another detector for your current measurement. Read more in the topic Detector selection.

Measure



From here you can open the Favorites list and find some functions that control how measured data are acquired.

Favorites - Shows the favorites list

Click on this button to show the Favorites list.

Get waveform - Enable waveform acquisition for every exposure

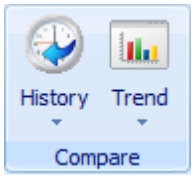
The default for this function is CHECKED. This means that a waveform will be acquired for every exposure. Uncheck this box if you don't want waveforms to be acquired for each exposure.

If you prefer to acquire waveforms sometimes but not all the time, you can specify in the test template whether or not you want to acquire the waveform. For example, if your test template contains four measurements, and you only want to acquire two waveforms, you can choose which two of the four measurements will acquire the waveform and which two will not. If you use this

option it will override the **Get waveform** checkbox.

Exposure assistant - Not available in this version

Compare



From here you can do trend analysis and easily look up previous measurements done earlier in the same room.

History - Shows previous similar tests from the same room

Click on this button to view the history of similar measurements in current room.

Trend - Trend analysis

Click on this button to start trend analysis. You can compare how different parameters change over time.

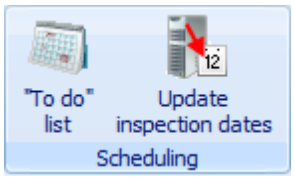
Bias



Bias off - Turns off the bias (only Barracuda)

Click on this button to turn off the bias when using Barracuda. If you use Piranha the bias is turned on when you power on the Chamber Adapter.

Scheduling



To do list - Shows your To do list

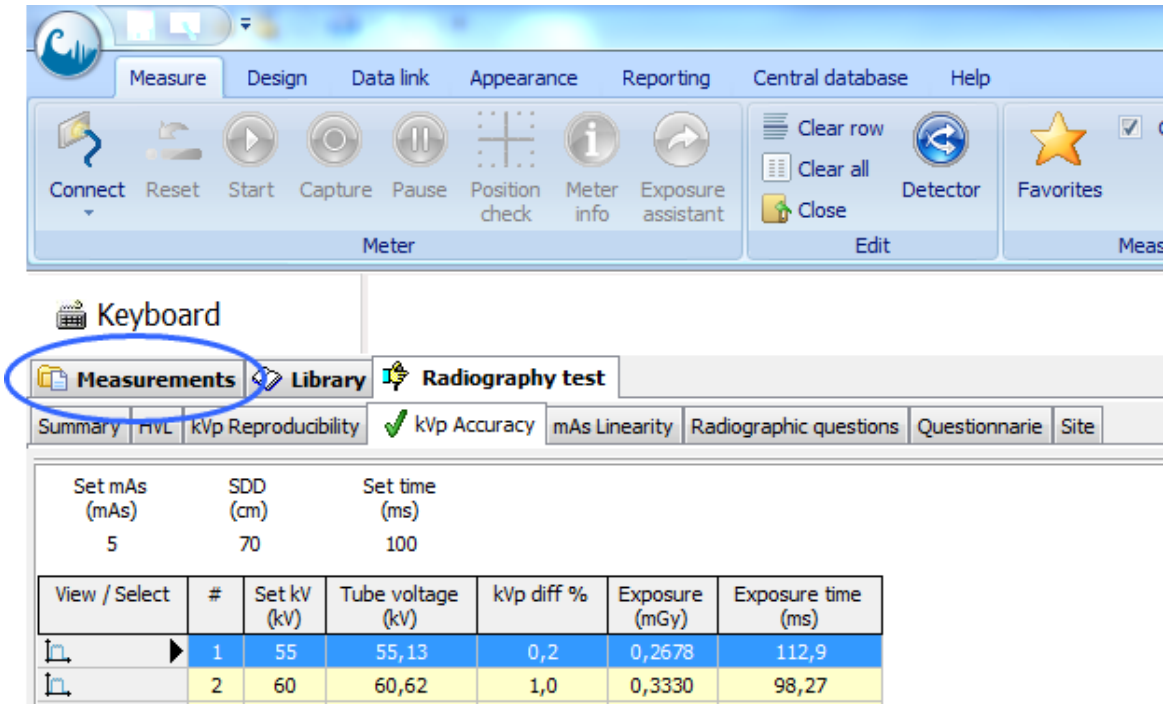
Click on this button to show the To do list.

Update inspection dates - Update inspection dates from the Central Database (only if Ocean Central is used)

This button is only used if Ocean Central is used. Read more here.

3.1.1 Measurements

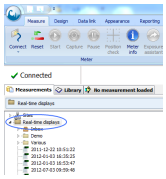
All measurements are stored in the database. You can access it via the Measurements tab (see picture below)



Click to compress

You can click on this tab and from here view/load any measurements you have done.

You can do two types of measurements:



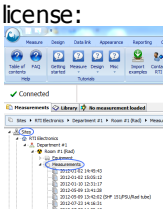
Click to compress

Real-time display - is a measurement setup with displays and a grid where measured data is logged. The real-time display can be configured in a variety of ways and optimized for different measuring requirements.

Real-time displays are saved in the database. The database is available on the Measurements tab located on the top of the main window. Click on the tab view the content. Real-time displays are located in the Real-time display folders. You can create your own sub folders here to organize your real-time measurements. If you click on a folder, the files in the folder are shown in a list view to the right.

A search function is available to quickly locate items in the database tree.

If you have Professional license:



Click to compress

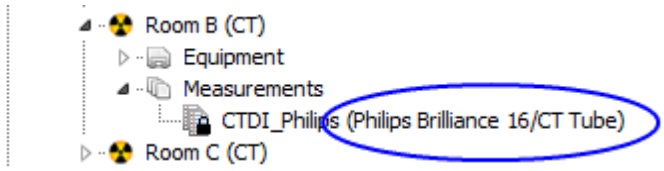
Session - is a number of tests/checklists forming a complete QA evaluation. Results are analysed and compared against specified acceptance limits. A session is assigned to a room and the different tests are used to verify the performance of the equipment in that room (generators, tubes and other user-defined equipment). A template for the session can be stored in the Library for quick and easy access. It is also possible to take an existing session (already performed) and re-use it in the same room or in another room.

Sessions are saved in the database in the Sites folder. The Sites folder contains the sites that consist of facilities, departments and rooms. The measured sessions are stored in the Measurements folder that is available for each room. This is a fixed folder and it is not

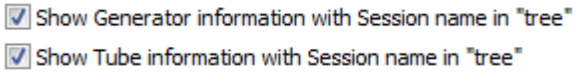
possible to create sub folders here.

A search function is available to quickly locate items in the database tree.

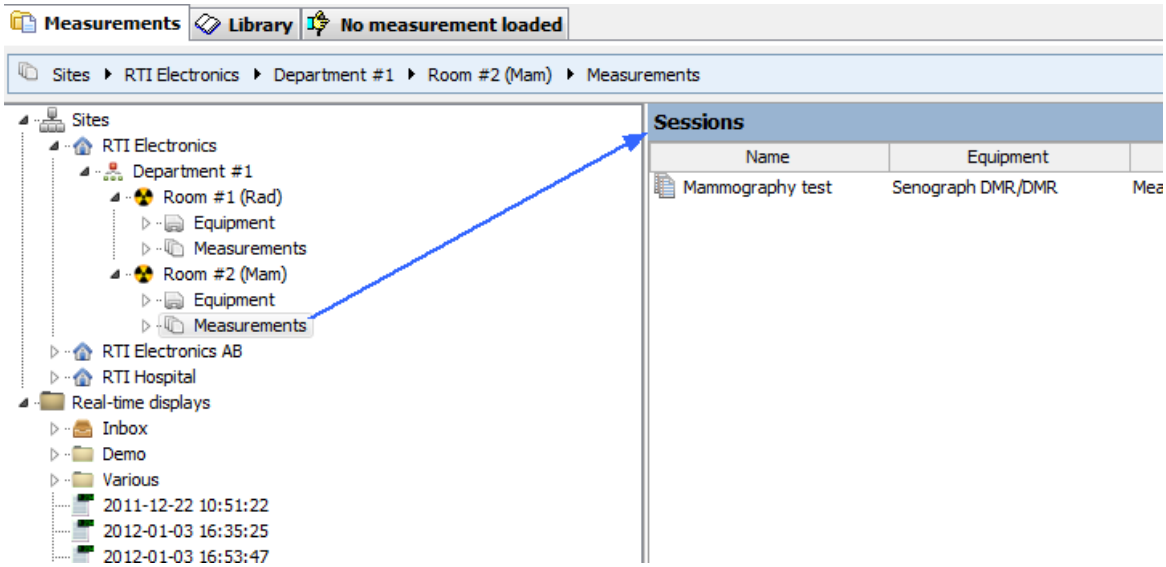
The measured sessions are shown in the Measurements folder in each room:



Each session is identified by the name you have given the it and succeeded by "(Generator name/ Tube Name)". You can individually turn on and off Generator name and Tube name in Program options:



You can also click on a folder and its content is then shown to the right:



Click to compress

Preveiw

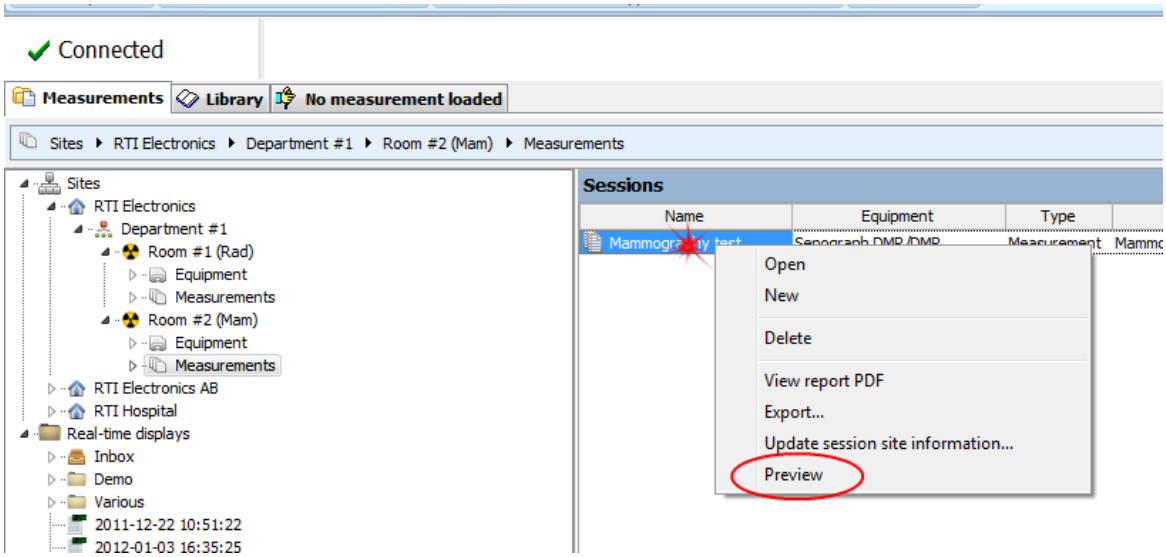
It may be convenient to use the preview function when looking for a specific measurement in the tree. You can preview in two different ways:

- click on a measurement (session or RTD) in the tree, the preview is then shown to the right
- right-click on a measurement (session or RTD) in the list view, the preview is then shown in a separate window

Preview from the list view:

1. Right-click on a measurment.

2. Select Preview from the menu:

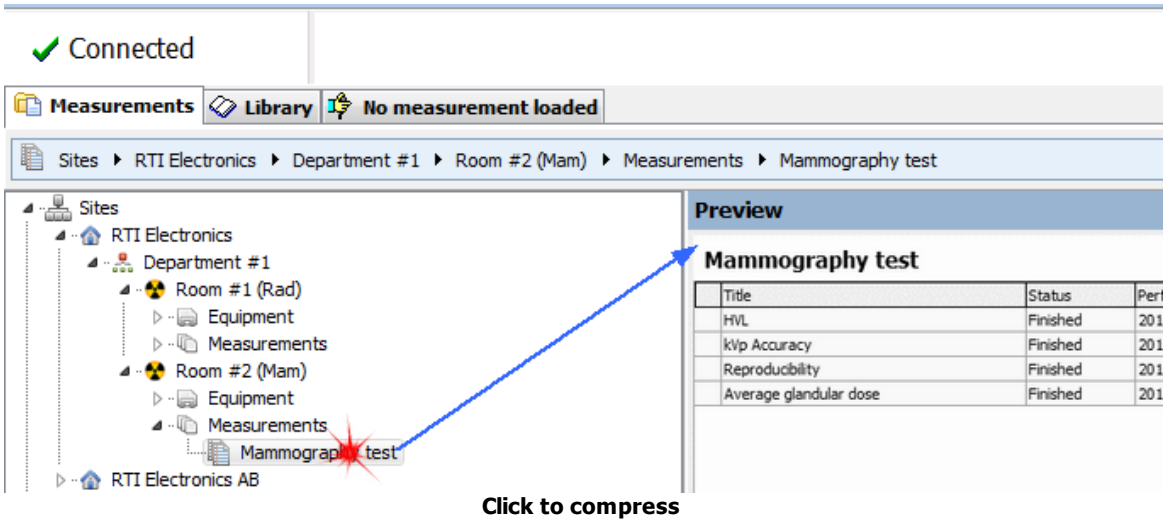


Click to compress

Preview from the tree:

1. Click on a measurement in the tree.

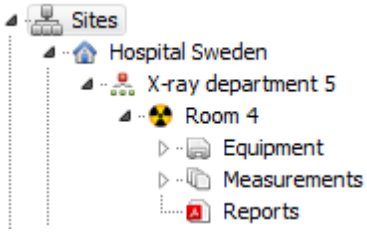
2. The preview is shown to the right:



Click to compress

3.1.2 Site

A site is a place where a QA session is performed. A site consist of a facility with one or more departments. Each department has one or several rooms. Each room has three fixed folders for data:

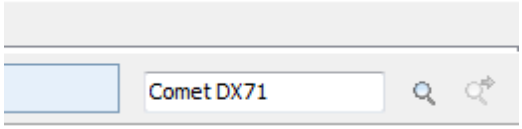


Equipment This is where all the equipment in a room is stored

Measurements This is where all the measured sessions are stored for the room

Reports This is where all the completed reports are stored for the room
Note: This version of Ocean is not using this folder

You can use the search field at the top and left side of the Measurement tab (and Library tab) to locate items in the database tree.



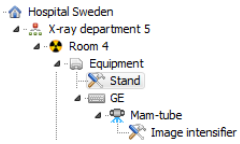
Type the item you wish to search for into the box, then click to start the search. You can move to the next occurrence by clicking .

3.1.3 Equipment

There is an **Equipment** folder for each room. Any equipment you create for a room will be stored here. Before you can do any testing, you need to create at least one generator with one or several tubes. Testing is then performed on the tube. Ocean needs to have access to the equipment information to choose what measurements are available for a given generator and tube configuration and analyze the results optimally.

You can also define user-defined equipment which can be Image intensifiers, Image receptors, Tables, Monitors or any other equipment in a room you want to do testing on and generate a report for.

The example below is what an **Equipment** would look like after you created equipment for a given room. The equipment is stored in a "tree" structure for easy look-up:



In this example we created a room with one generator and one tube with an image intensifier. We used the user-defined equipment option to create the image intensifier.

Any equipment in a room that will be tested with a meter "belongs" to a tube in the room. This "ownership" allows your meter to have access to all of the relevant information about the tube and the generator for an optimal testing situation.

There are some rules to follow when building the "equipment tree":

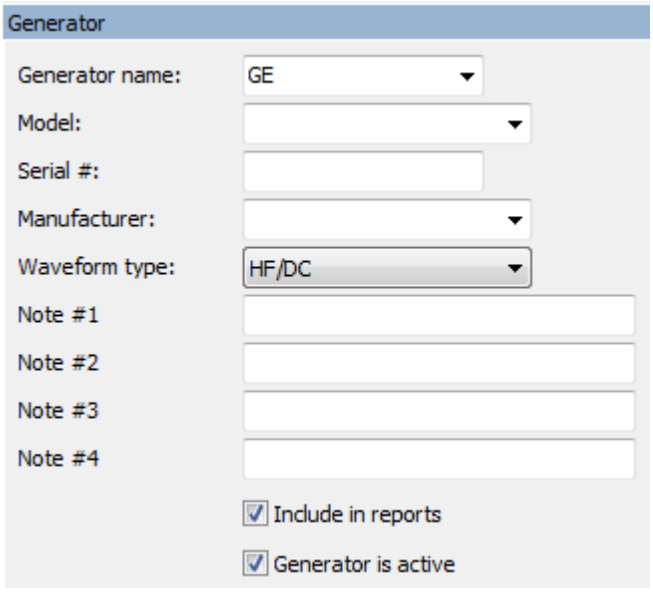
- A generator can only be located in the "root" (first level).
- A tube can only be attached to a generator.
- A user-defined equipment can be located on any level in the tree

For the purposes of testing a test, checklist or session is assigned or "owned" by an equipment item. The equipment item and it's "parents" are listed together as the "tested equipment" when you perform any testing. Using our example above, if we start a test for our image intensifier attached to the tube, the report will list the generator, tube and the image intensifier as the "tested equipment", not just the image intensifier alone, even though the actual test was on the image intensifier. You may not wish to include all equipment in a room in your report so you can exclude equipment by unchecking the **Include in report** checkbox.

The following equipment types are available:

Generator

In order for a generator to be created, you need to provide the following information:



Click to compress

The **Generator name** field is a mandatory field. It is used to identify the generator in the **Equipment** folder. You can edit the generator name field later if you want by clicking on it in the equipment tree.

The **Waveform type** field is set to "HF/DC" by default suitable for most modern generators. There are two special waveform types:

AMX-4 - use this for GE mobile units
Pulsed - use this for accurate kVp measurements on pulsed fluoroscopy systems

There are two checkboxes:

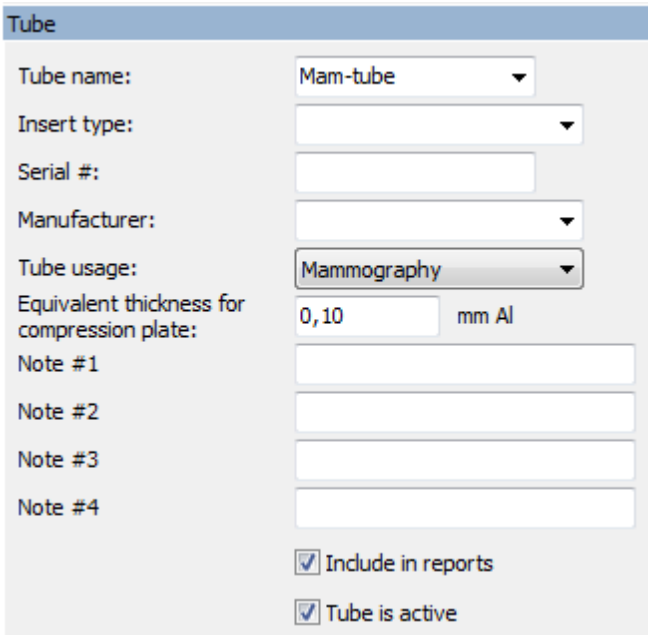
Include in reports - If unchecked the generator is not listed in the report.
Generator is active - Uncheck if the generator is replaced or removed from the room.

NOTE: It is possible to delete an "old" generator that was removed from a room, but if you just make the generator inactive instead of delete it altogether, you can keep it for reference purposes.

The **Generator ID** is only shown if this option is selected in Program options (not shown here). This field gives the generator a unique identifier in the database and is used for a more efficient import/export of your data.

Tube

In order for a tube to be created, you need to provide the following information for all tubes (except mammography tubes):



Click to compress

The **Tube name** and the **Total inherent filtration** (**Equivalent thickness** for compression plate for mammography tubes) fields are mandatory. The Tube name field is used to identify the tube in the Equipment folder. The Total inherent filtration (Equivalent thickness for compression plate for mammography tubes) value is used by Ocean to optimize and speed up the measuring process in some situations.

There are two checkboxes:

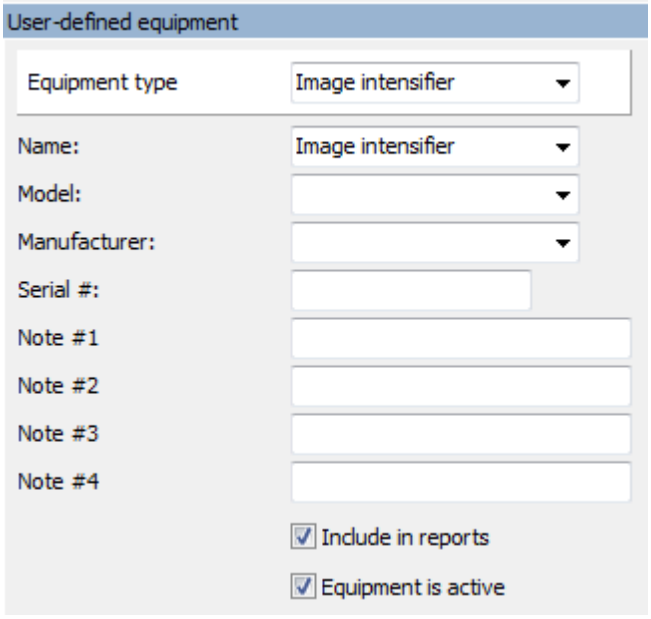
Include in reports - If unchecked the generator is not listed in the report.
Tube is active - Uncheck if the tube is replaced or removed from the room.

NOTE: It is possible to delete an "old" tube that was removed from a room, but if you just make the tube inactive instead of delete it altogether, you can keep it for reference purposes.

The **Tube ID** is only shown if this option is selected in Program options (not shown here). This field gives the tube a unique identifier in the database and is used for a more efficient import/export of your data.

User-defined

In order for a user-defined equipment to be created, you need to provide the following information:



Click to compress

The **Equipment type** field describes the type of equipment.

The **Equipment name** field is a mandatory field. It is used to identify the user-defined equipment in the **Equipment** folder. You can edit the generator name field later if you want by clicking on it in the equipment tree.

There are two checkboxes:

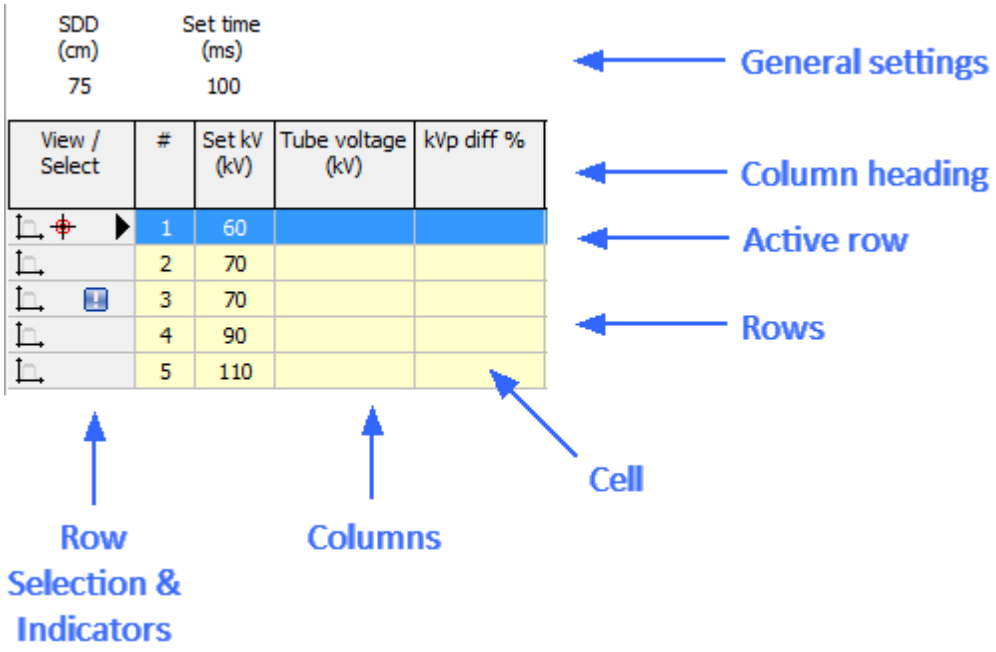
Include in reports - If unchecked the generator is not listed in the report.
Equipment is active - Uncheck if the equipment is replaced or removed from the room.

NOTE: It is possible to delete an "old" user-defined equipment that was removed from a room, but if you just make the user-defined equipment inactive instead of delete it altogether, you can keep it for reference purposes.

The **User-defined equipment ID** is only shown if this option is selected in Program options (not shown here). This field gives the user-defined equipment a unique identifier in the database and is used for a more efficient import/export of your data.

3.1.4 Grid and General settings

The grid is used to organize your measured data, set values and calculations. Each row represents one exposure. Different types of data are divided into different columns. Each row is identified by a row number and each column by a column heading.



Click to compress

Row selection

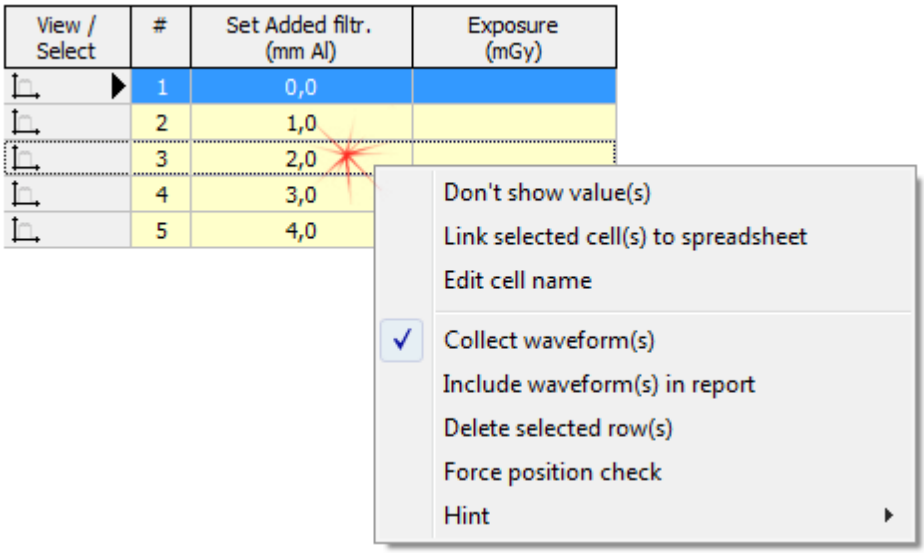
Click in this column when you want to activate a row. Active row is identified by the blue bar and the arrow in the left column. If the row you selected contains measurements, you can just move the mouse pointer over this column to view previous measurements. If you want to repeat a measurement click in this column on the row you want to repeat.

Columns

Each column represents a measured parameter, a set value or a calculated value.

Cell

Each cell contains a value (can be numeric, text or a file). If you right-click in a cell a menu is shown with a choice of cell functions you can choose from.



(The functions above are explained in more detail in the Design topic)

Rows

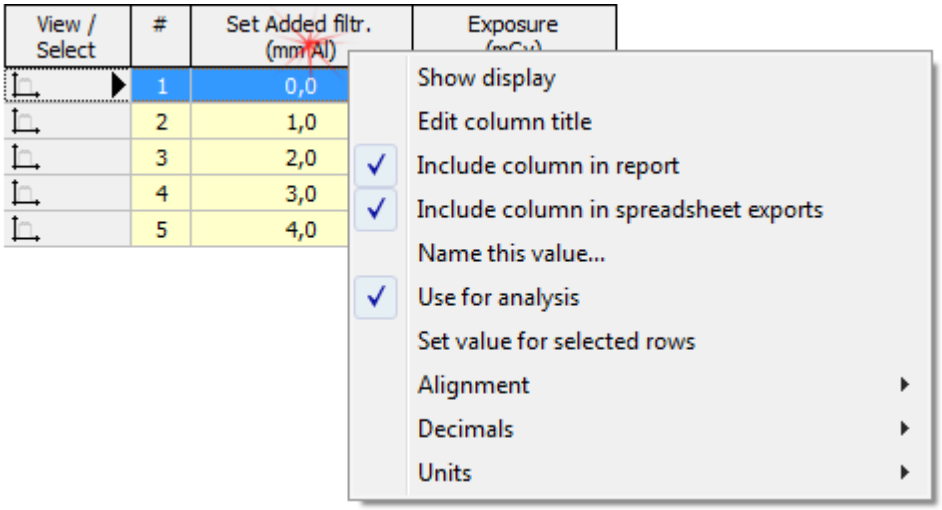
Each row contains all data collected from one exposure.

Active row

"Active row" is the row where data will go after the next exposure. The meter is "connected" to this row and set according to the stored meter settings for this row.

Column heading

The columns heading is used to identify a column and show what it is used for. All columns have a "Column title", it may also show a unit and a detector name. The detector name is optional and can be hidden by un-checking "Show detector name in column heading" on the Appearance tab of the Ribbon bar. A menu is shown with a choice of available column functions when you right-click on the column heading. If you hold the mouse pointer over a column, a hint will display which detector the column is related to.



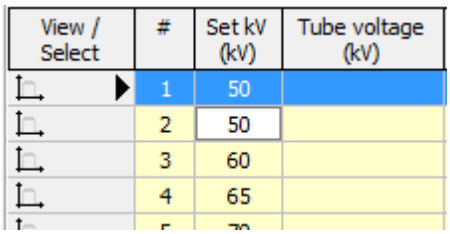
(The functions above are explained in more detail in the Design topic)

General settings

Parameters that have the same value for all rows in the grid can be placed in the General settings area instead of being in a column (as a column you would need to enter the same value for all of the rows). You can read in the topic Add/delete column or general settings how to add and modify the General settings.

Editing values in the grid

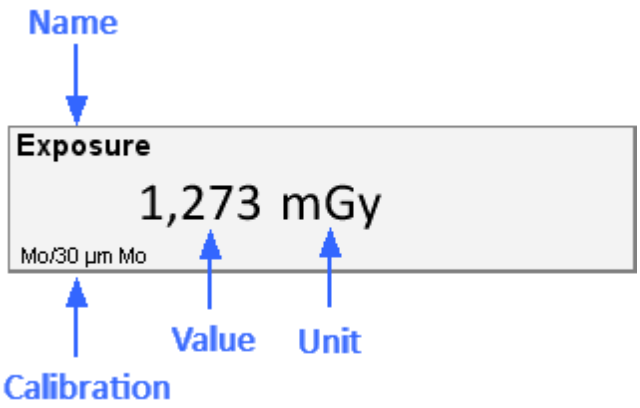
To edit a value in the grid (a set value or a measured value when keyboard is active) just click on the cell you want to edit:



The cell gets a white background and a frame to indicate that it is selected. You can now type a value (or a text if it is a text column). You can directly move up or down by pressing the UpArrow or DnArrow key. To move to the right or left, first press Enter and then the RightArrow or LeftArrow key.

3.1.5 Displays

Each column may have a corresponding display.



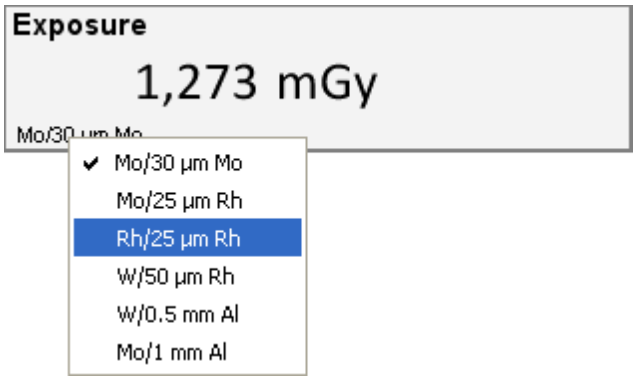
In a real-time display template displays are created by default. In a test template, only columns are created by default. You can right-click on any column heading and chose "Show display" to create a display for that column.

Name

This is the same as the column title. If you move the mouse pointer over the name, the name of the related detector (if any) is displayed. If you click on the name, the corresponding meter adjust tab is shown.

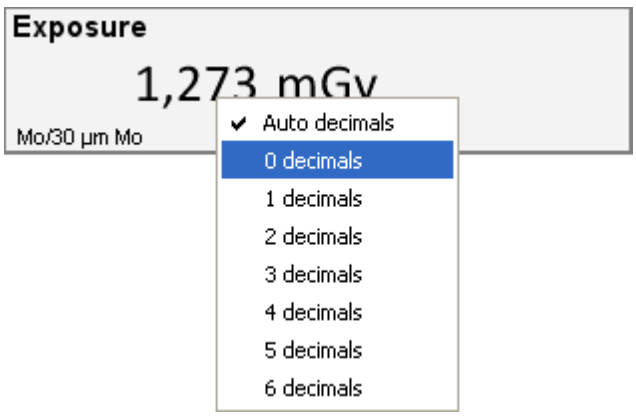
Calibration

If the column is related to a measured value, the calibration used is shown here. You can click on it to change calibration.



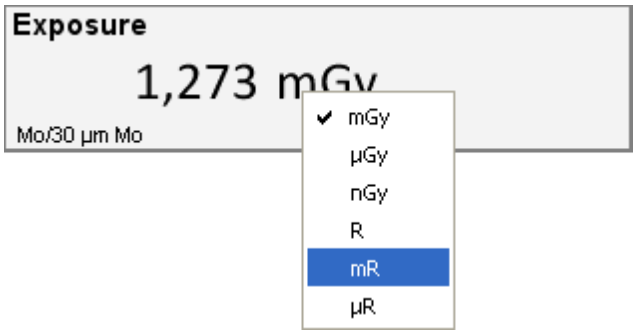
Value

This is the value for this parameter. You can click on it to change the number of decimals.



Unit

This is the unit used for this parameter. You can click on the unit to change it.



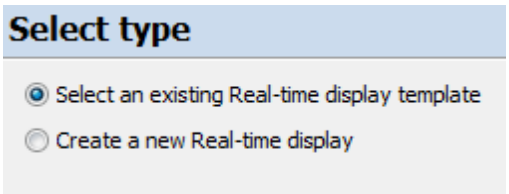
3.1.6 Start a new real-time display

A new real-time display can be started several ways. You can:

- select **New Real-time display** on the Application button
- create a new real-time display
- select a template from the Library
- select an already measured real-time display from the Measurement tab

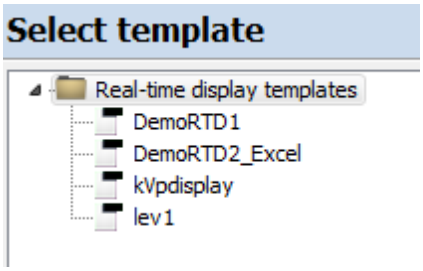
New Real-time display - Application button

1. Click the Application button and select New from the drop-down menu and choose New Real-time display.
2. The wizard to add new items to Ocean will start now and ask you if you want to use an existing real-time display or create a new one (see picture below).

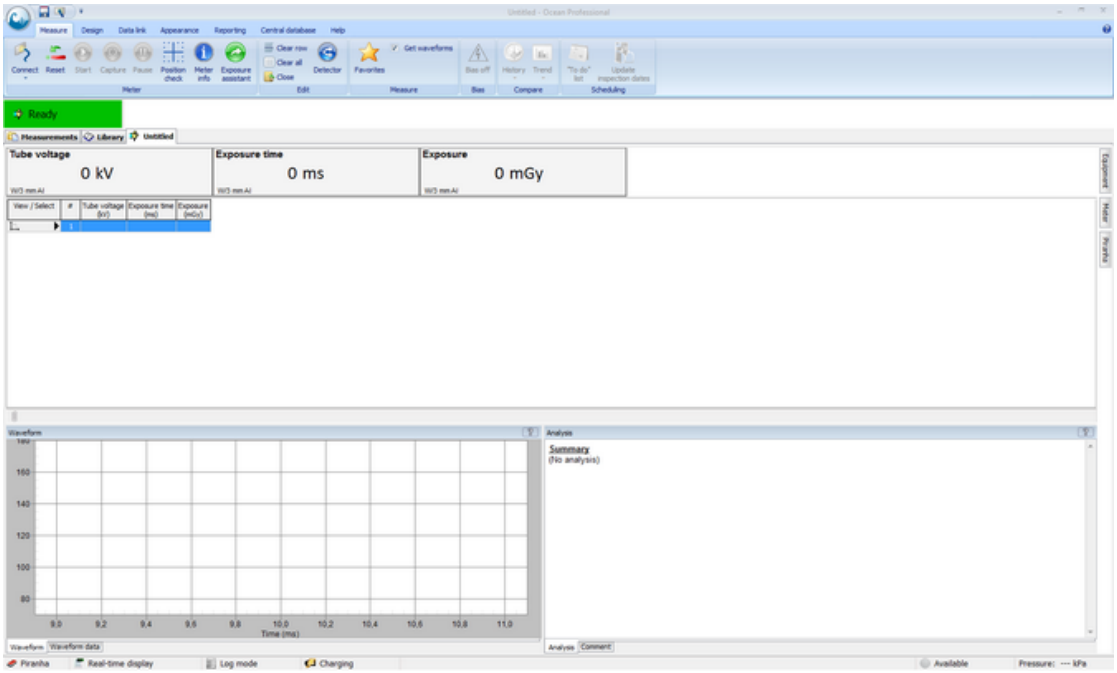


- **Select an existing Real-time display template choice**

3. For this example, we will choose "Select an existing Real-time display template" and click Next to continue.
4. The wizard will display the Real-time display part of the Library and ask you to select a template. The real-time display part of the Library looks like the picture below.



If you already have real-time display templates in your Ocean, just select a template from this part of the Library and click Finish to end the wizard and open the selected template. When a template is opened, your screen should look similar to the one below.



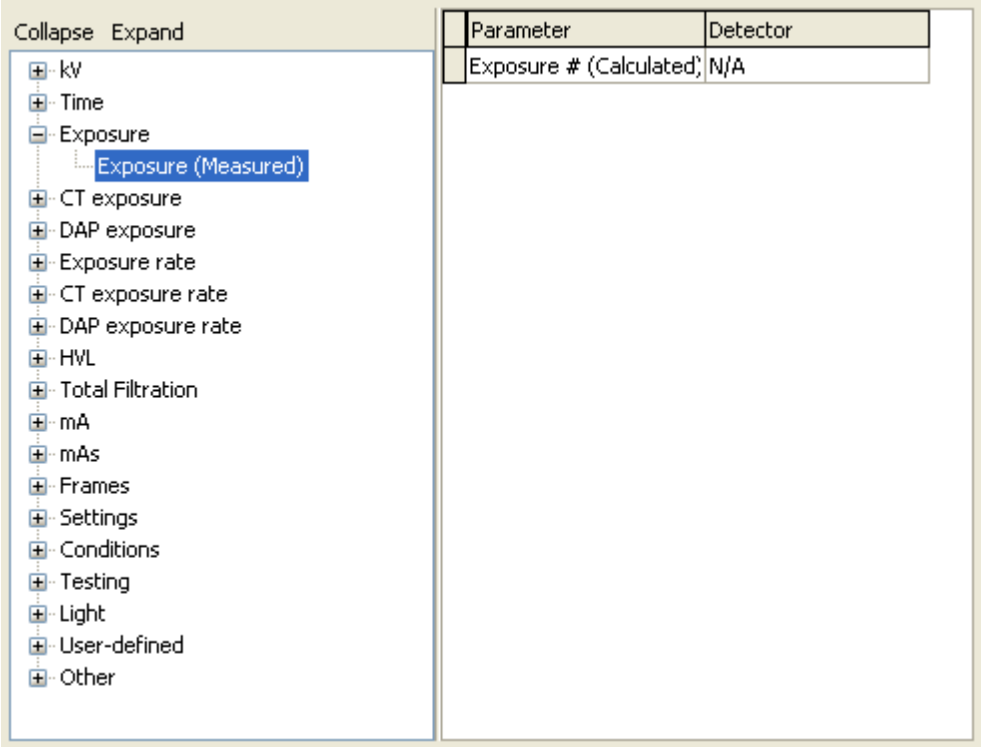
You can start making exposures now if your meter is already connected and the left part of the status bar indicates READY. If not, connect the meter and click the Connect button.

5. Once you have finished with making exposures, click the Save button and give it a name to save your work.

-End-

- **Create a new Real-time display choice**

3. For this example, we will choose "Create a new Real-time display" and click Next to continue.
4. The first thing you will be asked to do is to select a modality. Select one now and click Next to continue.
5. Once you chose your modality, you will need to add the displays to your template. The displays are grouped by category on the left to make it easier to find the ones you want (see the picture below). Choose a category by clicking on it.



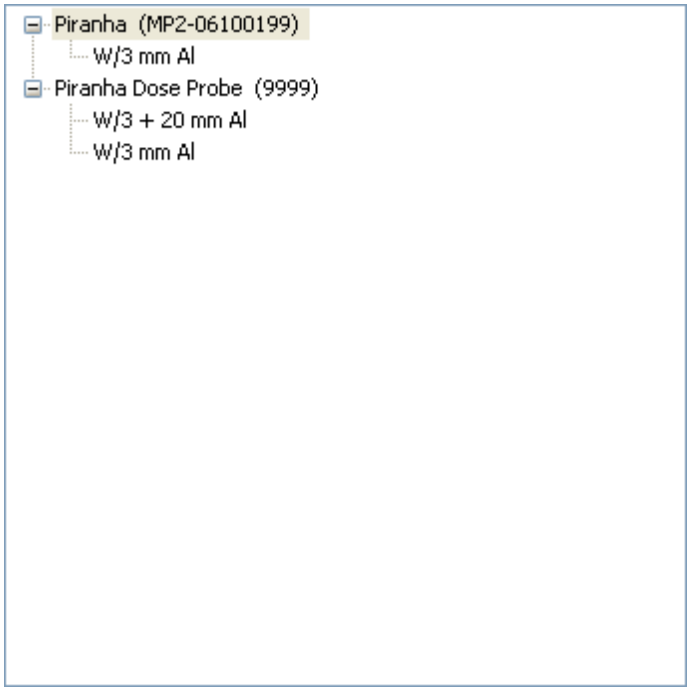
Click to compress

If you want more detailed information on how to design a new real-time display, you can read more about it here .

6. The available displays are shown on the left under the category heading. What is shown depends on what license level of Ocean you have. Choose a display by double-clicking on it.

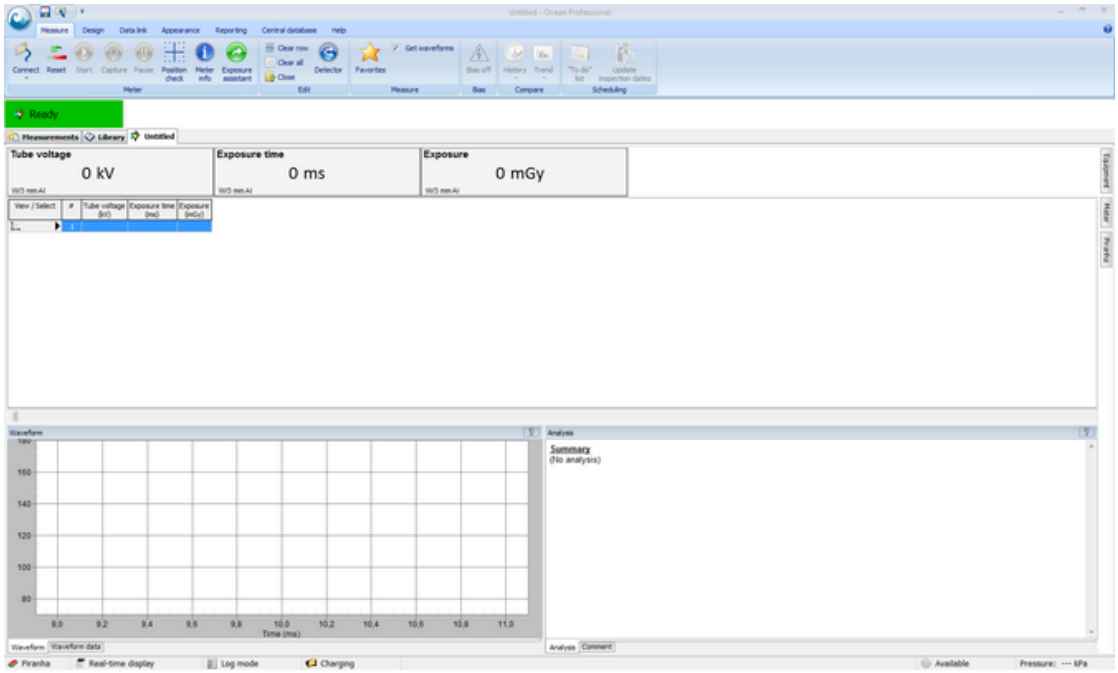
Note: If you chose a measured value display, another window will pop up (see picture below) asking you to choose a detector/calibration type before your selection appears on the right side of the screen. Ocean will create a "virtual meter" containing all available detector/calibration types capable of measuring the value you chose if you are building a template without a meter connected, but make sure you only choose a detector/calibration type you actually have.

Note: If you have a Piranha the detector you intend to use must be connected to your meter when you choose a measured display.



Click to compress

7. Repeat step #6 until you have selected all the displays (all the parameters you want to measure) you want.
8. The Real-time display now created and loaded.



You can start making exposures now if your meter is already connected and the left part of the status bar indicates READY. If not, connect the meter and click the Connect button.

9. Once you have finished with making exposures, click the Save button and give it a name to save your work.

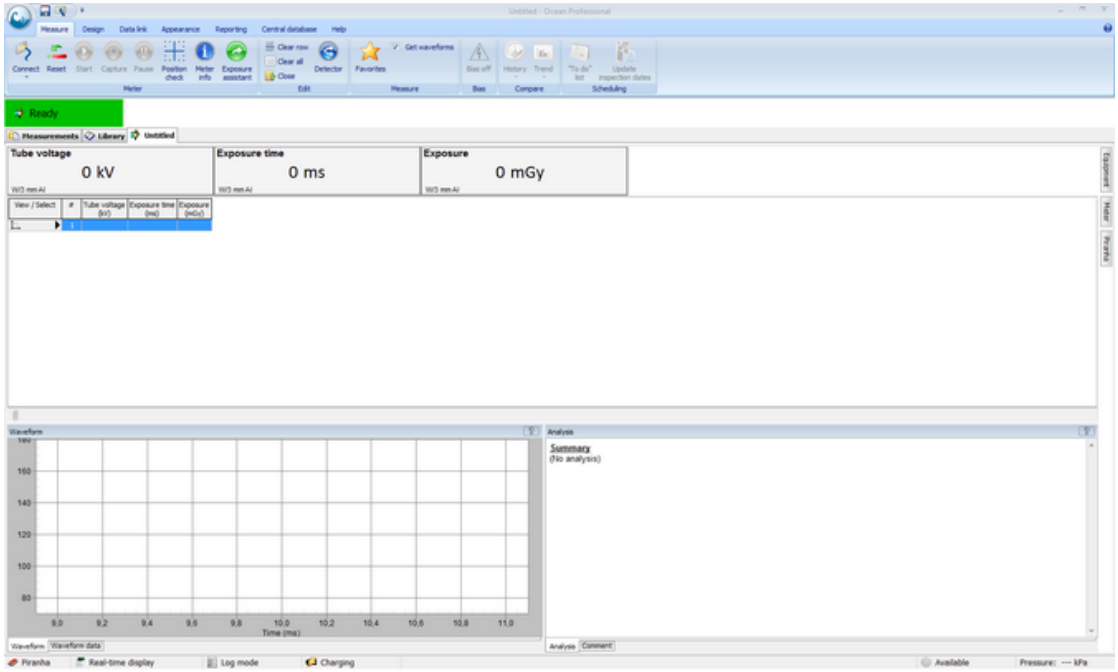
-End-

From a template - Double-click on a template in the Library

1. Click on the Library tab browse and find the real-time display template you want and double-click on it.
2. The detector selection is shown and you can chose detector(s).

Note: If you have a Piranha, there will be instances when the detector selection screen will not be shown. For example, if you measure kVp, there is really only one choice.

3. The Real-time display is now loaded.



You can start making exposures now if your meter is already connected and the left part of the status bar indicates READY. If not, connect the meter and click the Connect button.

4. Once you have finished with making exposures, click the Save button and give it a name to save your work.

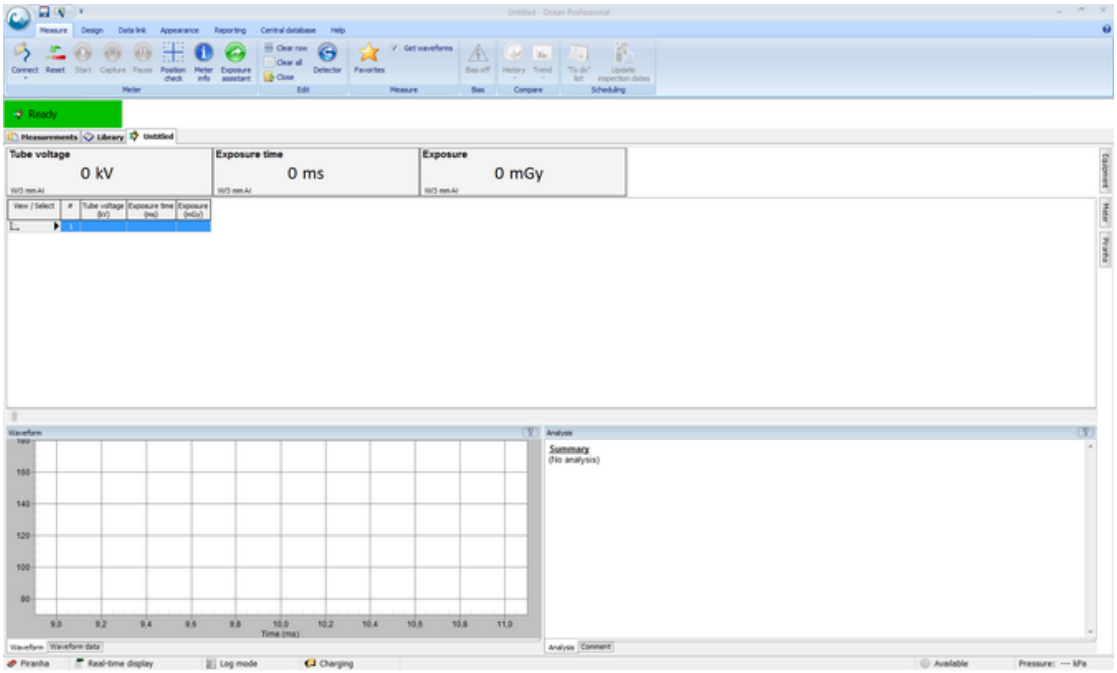
-End-

New - Right-click on a measured real-time display in the Measurements

1. Click on the Measurements tab and double-click on the real-time display you want.
2. The detector selection is shown and you can chose detector(s).

Note: If you have a Piranha, there will be instances when the detector selection screen will not be shown. For example, if you measure kVp, there is really only one choice.

3. The Real-time display is now loaded.



You can start making exposures now if your meter is already connected and the left part of the status bar indicates READY. If not, connect the meter and click the Connect button.

4. Once you have finished with making exposures, click the Save button and give it a name to save your work.

-End-

3.1.7 Start a new session

You can start a new session in four different ways:

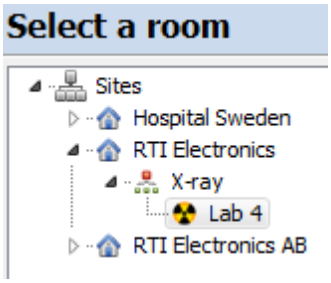
- Select **New session** on the Application button; select a session template and room to test
- Select a session template from the Library and select a room to test
- Select an old session and use it as a session template for a new measurement in the same or in another room
- Select a room to test first and then a session template

New session - Start from the Application button

The steps are:

Select a room -> Select a template -> activate a test or checklist -> start to work

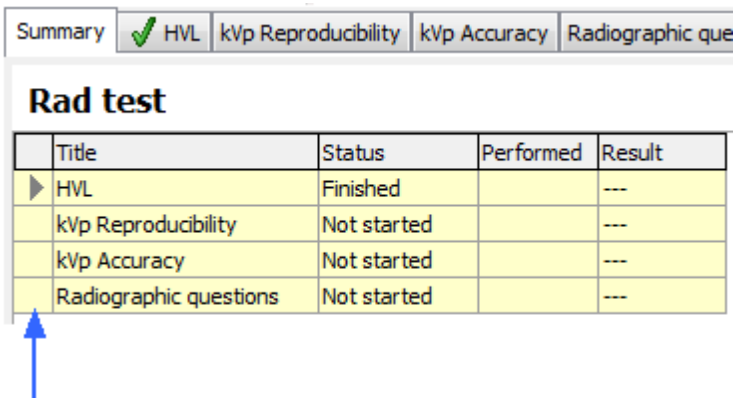
1. Go to the Application button and select New session
2. The new session wizard is now activated and it will ask you to select a room. Look up the facility and click on it, look up the department and click on it, then select the room you want:



3. When you click Next to continue, the wizard will give you a choice to choose an existing session template from the Library or design a new one "on the fly". Each choice will be described below in more detail.

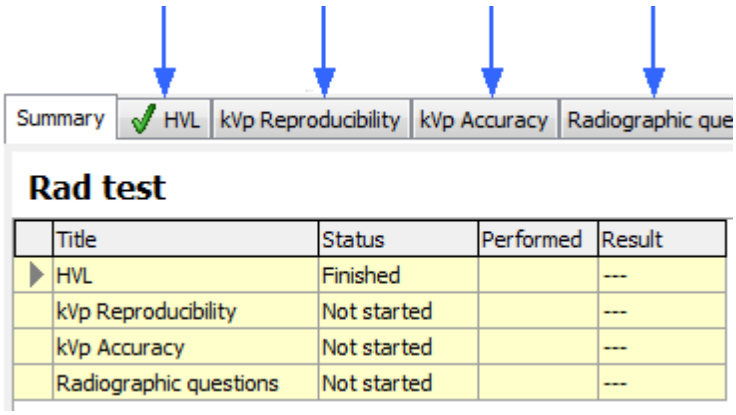
- **Select an existing session template**

4. Choose "Select an existing Session template" and click Next. The Library will be displayed showing the available templates.
5. Select a session template and click Next.
6. Enter Inspector and company (default is specified in the program options) and click Next.
7. Choose a session name (this is the name it is saved with) and click Finish.
8. The session is loaded and ready for measurements immediately if the checkbox "Auto-start session" is checked in the Program options. If not, the summary tab is displayed, showing all the tests and checklists that are part of the session template. You can now start a test or checklist.



Double click in the first column of the test or checklist you want to start. The test or checklist is opened and the first row is activated.

You can also select a test or checklist by clicking on a tab.



When the test or checklist is shown, you can click on the row you want to start with and that row will be activated.

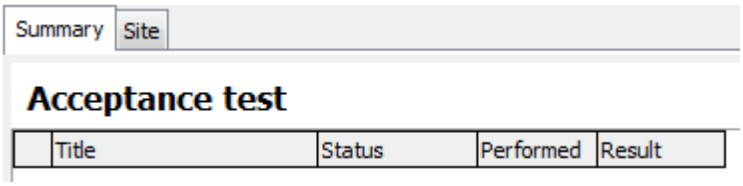
9. When you activate a test or a checklist a wizard starts letting you choose the equipment to test.

In some cases you may be asked to choose a detector(s) to use, Detector selection.

-End-

- **Design a new session template "on-the-fly"**

4. Select "Create a new session" and click Next.
5. Enter Inspector and company (default is specified in the program options) and click Next.
6. Choose a session name (this is the name it is saved with) and click Finish. An empty session template is created (no tests or checklists are present at this time). Your screen should look like the picture below:



7. Now you need to add tests and checklists. Click on **Add test** or **Add checklist**. You can either add a test or checklist template from the library or create a new one. How to create a new one is described in the topics New Test template and New Checklist template.
8. When you have added at least one test or checklist template to your session you can start making measurements.
9. When you activate a test or a checklist a wizard starts letting you choose the equipment to test. In some cases you may be asked to choose a detector(s) to use, Detector selection.

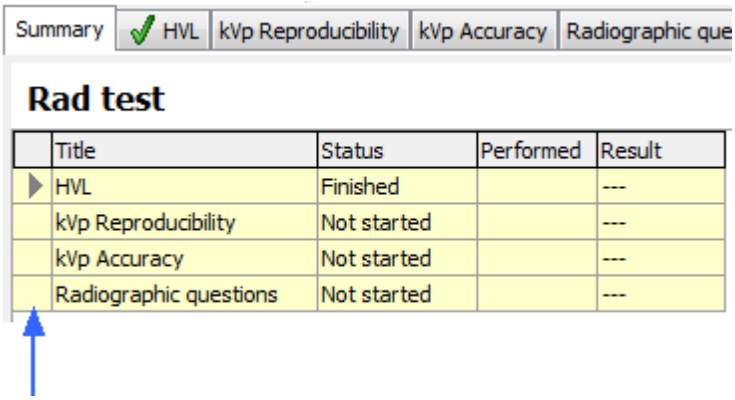
-End-

Template - Start from a template in the Library

The steps are:

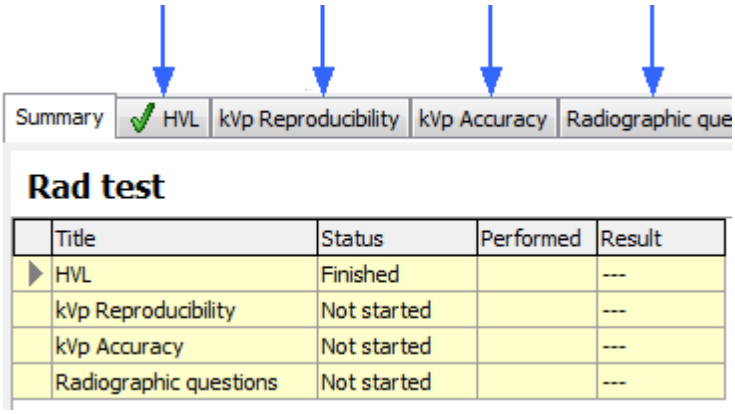
Select a session template -> Select a room -> activate a test or checklist -> start to work

1. Go to the Library tab and locate the Session template folder.
2. Look up the session you want to use and double-click on it.
3. The session wizard is now activated and it will ask you to select a room. Look up the facility and click on it, look up the department and click on it, then select the room you want.
4. Enter Inspector and company (default is specified in the program options) and click Next.
5. Choose a session name (this is the name it is saved with) and click Finish.
6. The session is now loaded and the session summary is displayed. The summary shows all the tests and checklists included in the session you chose. You are now ready to begin making measurements.



Double click in the first column for the test or checklist you want to start. The test or checklist is opened and the first row is activated.

You can also select a test or checklist by clicking on a tab.



When the test or checklist is shown, you can click on the row you want to start with and that row will be activated.

7. When you activate a test or a checklist a wizard starts letting you choose the equipment to test. In some cases you may be asked to choose a detector(s) to use, Detector selection.

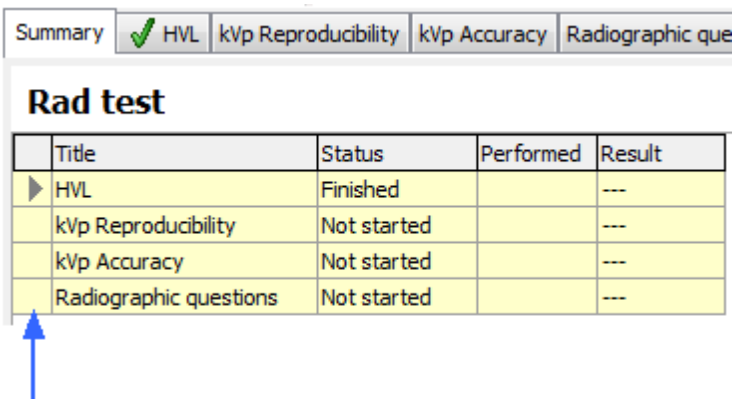
-End-

Select an old session - Start from an already finished session

The steps are:

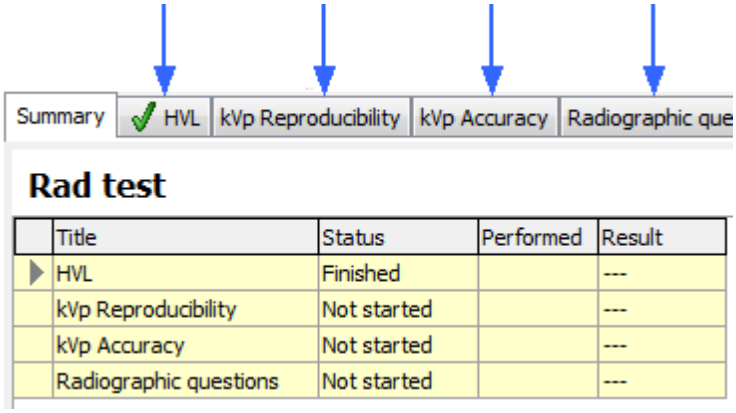
Select an existing session -> Select a room -> activate a test or checklist -> start to work

1. Go to the Measurements tab and locate the session you want to use and right-click on it. You can find sessions in the Measurement folder in a room.
2. The session wizard is now activated and it will ask you if you want to use your chosen template in the same room or in another room. Make your choice and click Next to continue.
3. If you chose "another room" you will be asked to select a facility/department and room. Make your selection and click Next to continue.
4. Enter Inspector and company (default is specified in the program options) and click Next.
5. Choose a session name (this is the name it is saved with) and click Finish.
6. The session is now loaded and the session summary is displayed. The summary shows all the tests and checklists included in the session you chose. You are now ready to begin making measurements.



Double click in the first column for the test or checklist you want to start. The test or checklist is opened and the first row is activated.

You can also select a test or checklist by clicking on a tab.



When the test or checklist is shown, you can click on the row you want to start with and that row will be activated.

7. When you activate a test or a checklist a wizard starts that allows you to specify the equipment to test. In some cases you may be asked to specify the detector(s) to use, Detector selection.

-End-

Select a room to test - Start by selecting the room to test

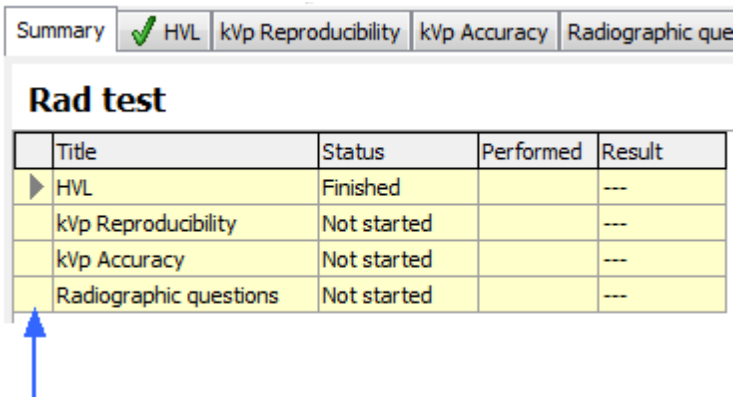
The steps are:

Select a room -> Select a session -> activate a test or checklist -> start to work

1. Go to the Measurements tab and select "New session".
2. The session wizard is now activated and it will ask you if you want to use an existing session template form the Library or design a new one "on-the-fly".

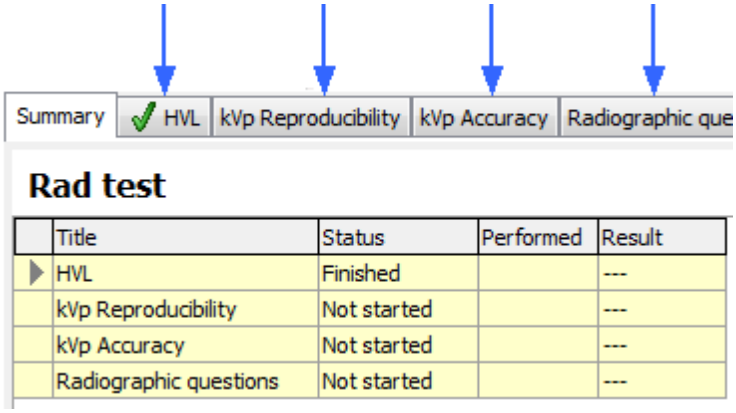
- **Select an existing session template**

3. Choose "Select an existing Session template" and click Next. The Library will be displayed showing the available templates.
4. Select a session template and click Next.
5. Enter Inspector and company (default is specified in the program options) and click Next.
6. Choose a session name (this is the name it is saved with) and click Finish.
7. The session is loaded and ready for measurements immediately if the checkbox "Auto-start session" is checked in the Program options. If not, the summary tab is displayed, showing all the tests and checklists that are part of the session template. You can now start a test or checklist.



Double click in the first column for the test or checklist you want to start. The test or checklist is opened and the first row is activated.

You can also select a test or checklist by clicking on a tab.



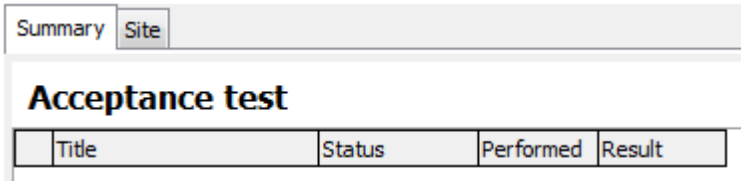
When the test or checklist is shown, you can click on the row you want to start with and that row will be activated.

8. When you activate a test or a checklist a wizard starts that allows you to specify the equipment to test. In some cases you may be asked to specify the detector(s) to use, Detector selection.

-End-

- **Design a new session template "on-the-fly"**

3. Select "Create a new session" and click Next.
4. Enter Inspector and company (default is specified in the program options) and click Next.
5. Choose a session name (this is the name it is saved with) and click Finish. An empty session template is created (no tests or checklists are present at this time). Your screen should look like the picture below:

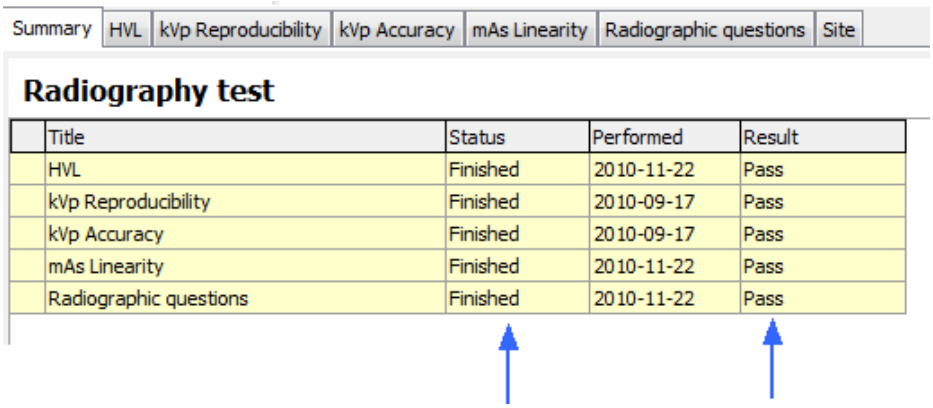


6. Now you need to add tests and checklists. Click on **Add test** or **Add checklist**. You can either add a test or checklist template from the library or create a new one. How to create a new one is described in the topics New Test template and New Checklist template.
7. When you have added at least one test or checklist template to your session you can start making measurements.
8. When you activate a test or a checklist a wizard starts letting you choose the equipment to test. In some cases you may be asked to choose a detector(s) to use, Detector selection.

-End-

Finish a session - Summary page and signing

Go to the Summary page when all tests are completed. You can now see the status and result for each test and checklist in the session.



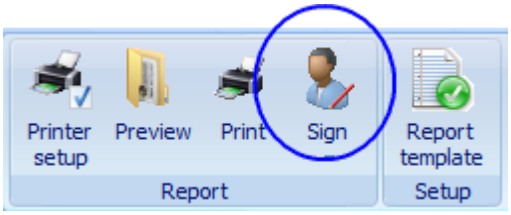
Status is normally auto generated but you can select status manually by right-clicking on the status text. The result column shows the result, if all analysis passed "Pass" is shown, otherwise "Fail".

Signing

It is now time to sign the session if you are using the signing function. Normally, if you use the signing function, you have already specified a signature file and a password in Program options. To sign the session

1. Go to the Reporting tab on the Ribbon bar.

2. Click on Sign.



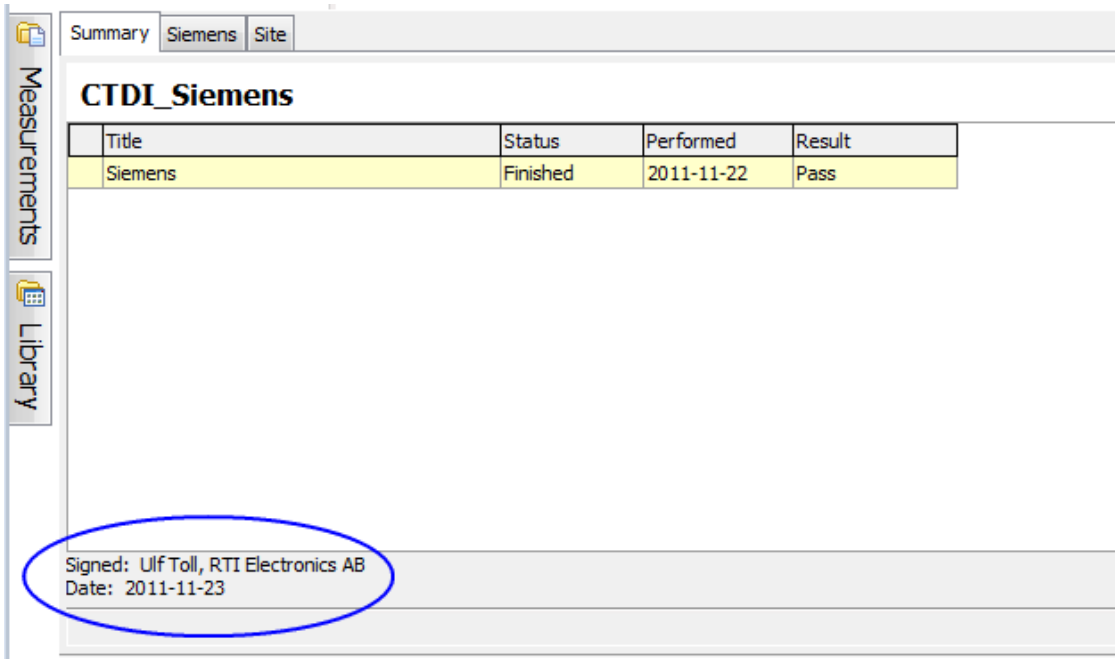
3. A dialogue is shown:


Sign Session
After the session has been signed, it will be saved and cannot be saved again unless the signature has been removed.
Sign
Cancel

4. If a password is required you are asked to enter that now. Click OK.

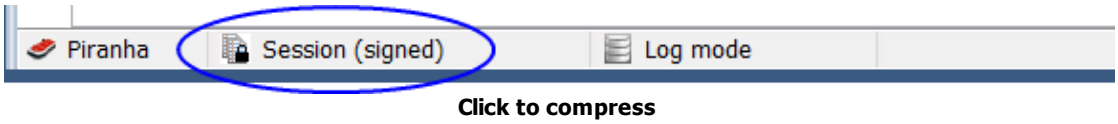
5. Now the sesion is signed and you can't save it again. If you need to modify it, you must first remove your signature. You do that by clicking on the Sign button and select **Remove signature**.

That a session is signed is indicated in different ways. It is shown on the summary page:



Click to compress

It is also shown on the lower status bar:



Click to compress

The signature is shown in the report:

CTDI Siemens

Report date: 2011-11-23 **Tester:** Mike
Company: RTI

Site information

Facility name:	RTI Electronics	**Department:**	X-ray department
Address:	Flöjelbergsgata 8C	**Room:**	Room C (CT)
City:	Mölndal	**Note #1**	
State/province:		**Note #2**	
Postal code:	431 37	**Note #3**	
Country:	Sweden	**Note #4**	

Content

Title	Status	Performed	Result
Siemens	Finished	2011-11-22	Pass

Signature: Date: 2011-11-23

Ulf Toll

Ulf Toll, RTI Electronics AB

Click to compress

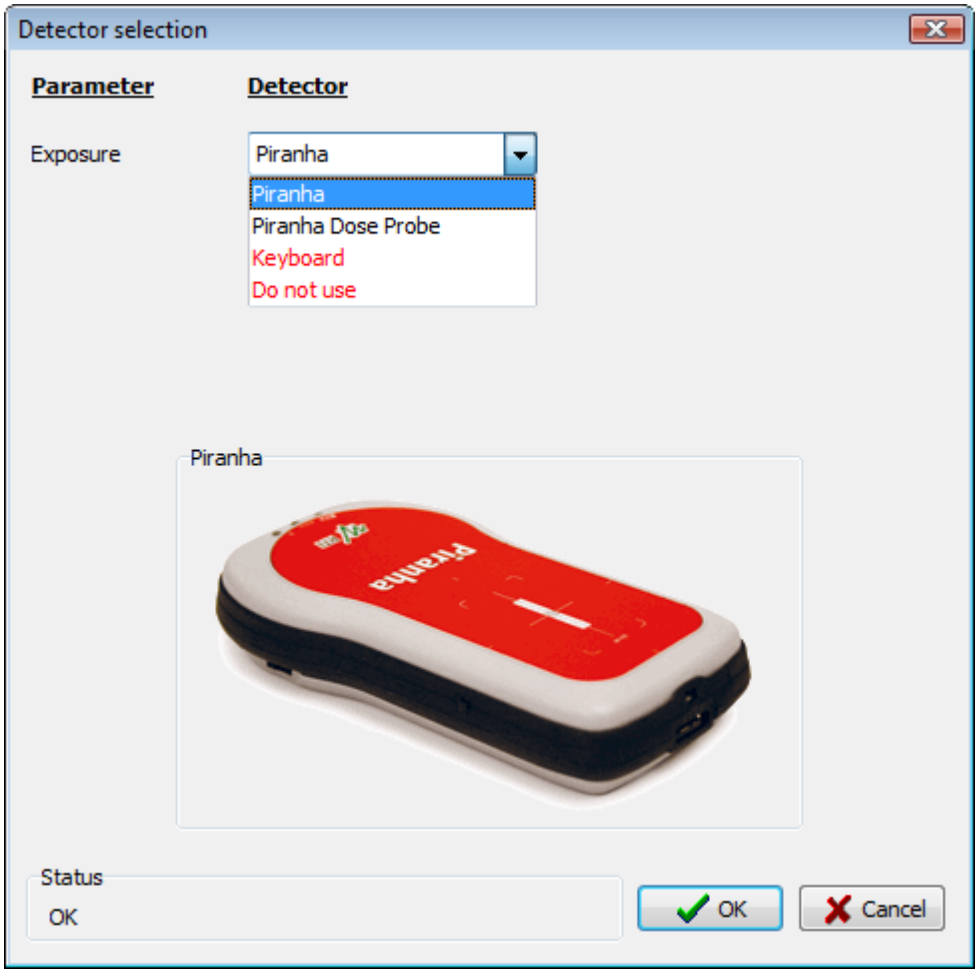
-End-

3.1.8 Detector selection

Each test and real-time display template has detector information stored in it. When a test or a real-time display is activated with a meter connected, this detector information is compared against what is available in the connected meter.

- **Pirahna**

As long as the required external detector (if used) is connected to the Piranha, the detector selection dialogue is not shown. The following dialogue is displayed if the detector connected is not suitable for the measurement you want to make.



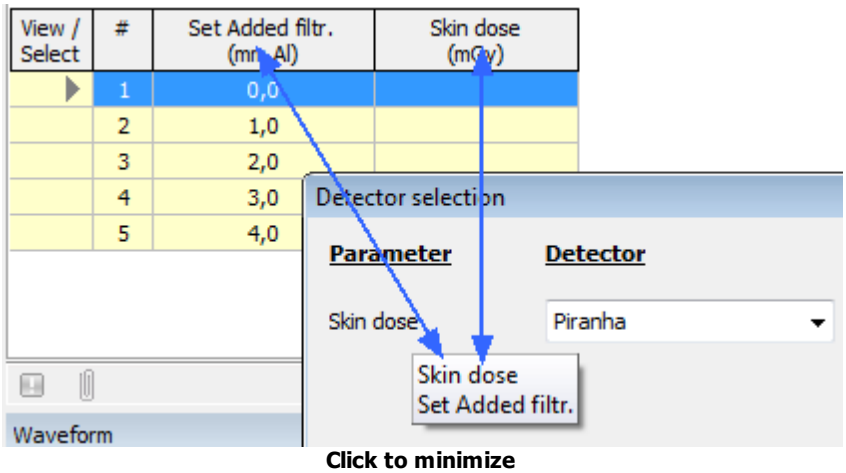
Click to minimize

When a suitable detector is recognized the dialogue closes. You have the following two choices if there is no suitable detector found:

Keyboard
If you select this option, you will be prompted to manually enter data for each exposure instead of getting it directly from the meter.

Do not use
If you select this option, the parameter is ignored and no data will be recorded for this parameter.

If you move the cursor over the parameter texts to the left, the column title "belonging" to this parameter is displayed.

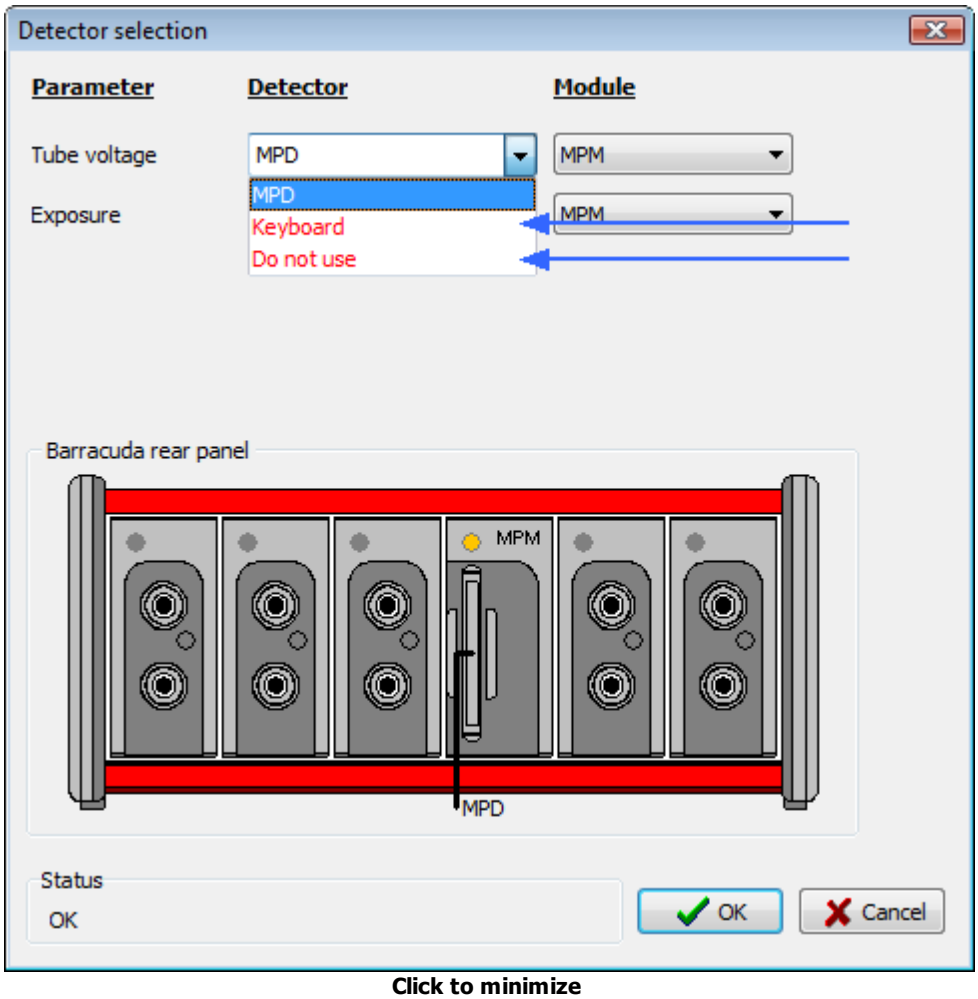


Click to minimize

-End-

- **Barracuda**

The detector selection dialogue is shown before a test is activated.



Click to minimize

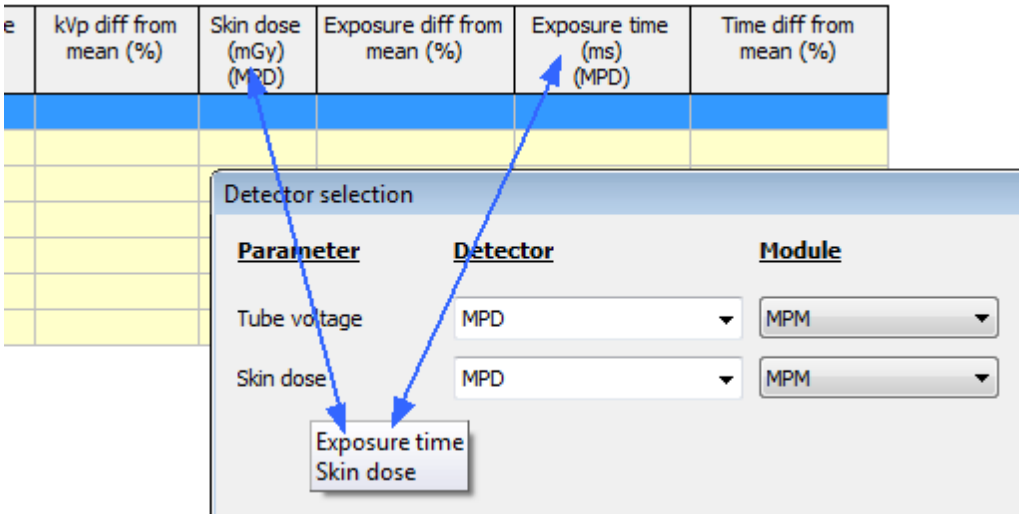
You can choose which detector you want to use in this dialogue. Make sure that the selected detector is connected to the correct module as shown in the dialogue. In case a suitable detector is not available you have possibilities:

Keyboard
If you select this option, you will be prompted to manually enter data for each exposure instead of

getting it directly from the meter.

Do not use
If you select this, the parameter is ignored and no data will be recorded for this parameter.

If you move the cursor over the parameter texts to the left, the column title "belonging" to this parameter is shown.

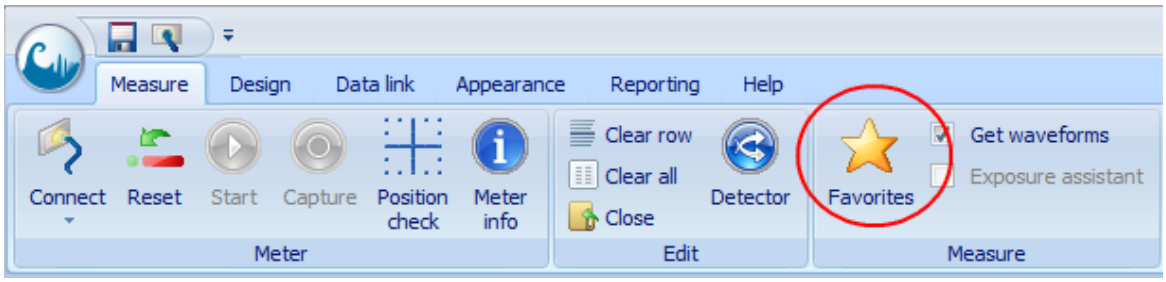


Click to minimize

-End-

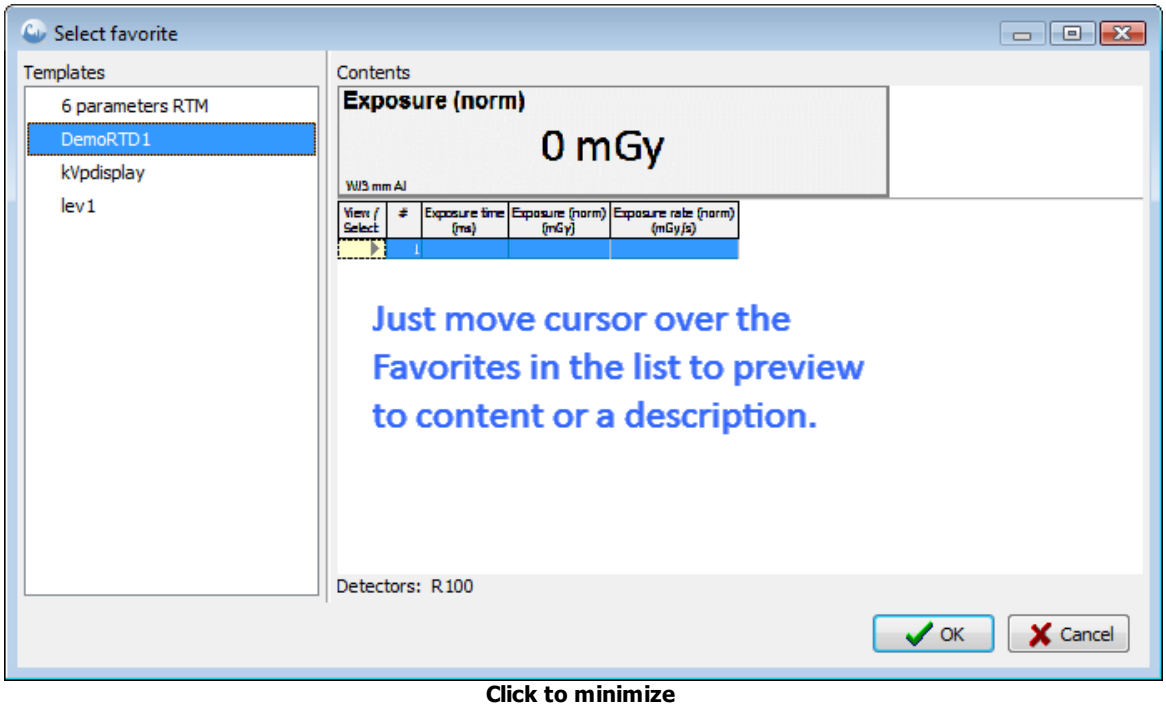
3.1.9 Favorites

Ocean has a Favorites list where your favorite templates are listed and easily accessed when you need them. The Favorites list is opened from the button on the Ribbon bar.



Click to minimize

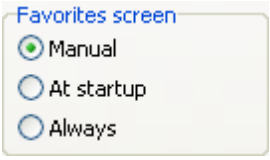
When you click on the button, the Favorites list is shown:



Click to minimize

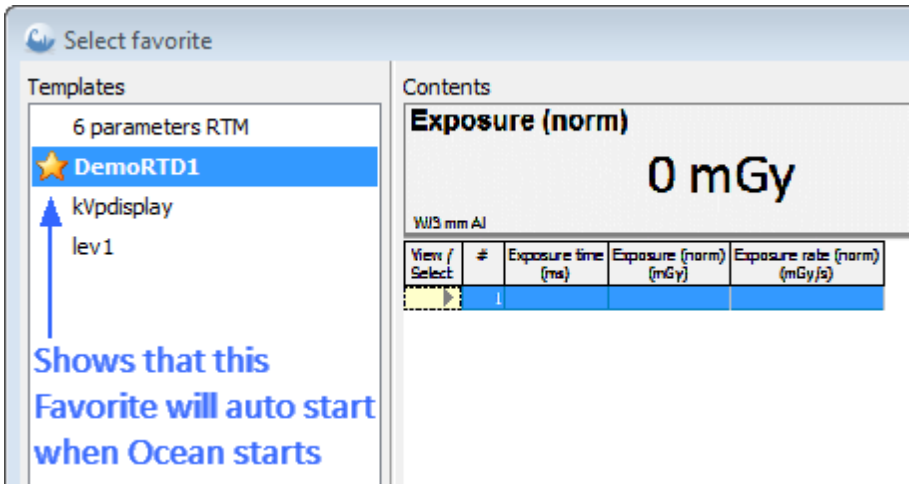
Double-click on the favorite you want to use. If your meter is connected and "on line" it is initialized and prepared for making measurements automatically. See also Auto start and auto connect.

The Favorites list may also displayed automatically depending on the settings in Ocean's Program options:



Always = each time Ocean's workspace is empty. This is when Ocean starts and each time you click on Close.

You can select a template that should auto start each time Ocean is started.



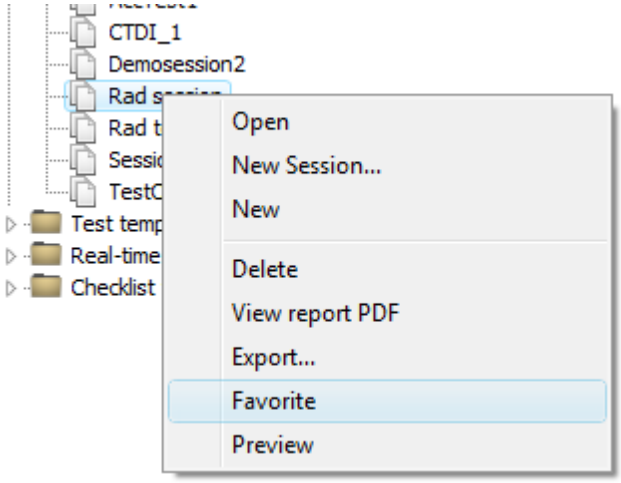
Click to minimize

To do this, right-click on a template and click on "Auto start".

How to set a favorite:

1. Look up the template you want to use as a favorite.

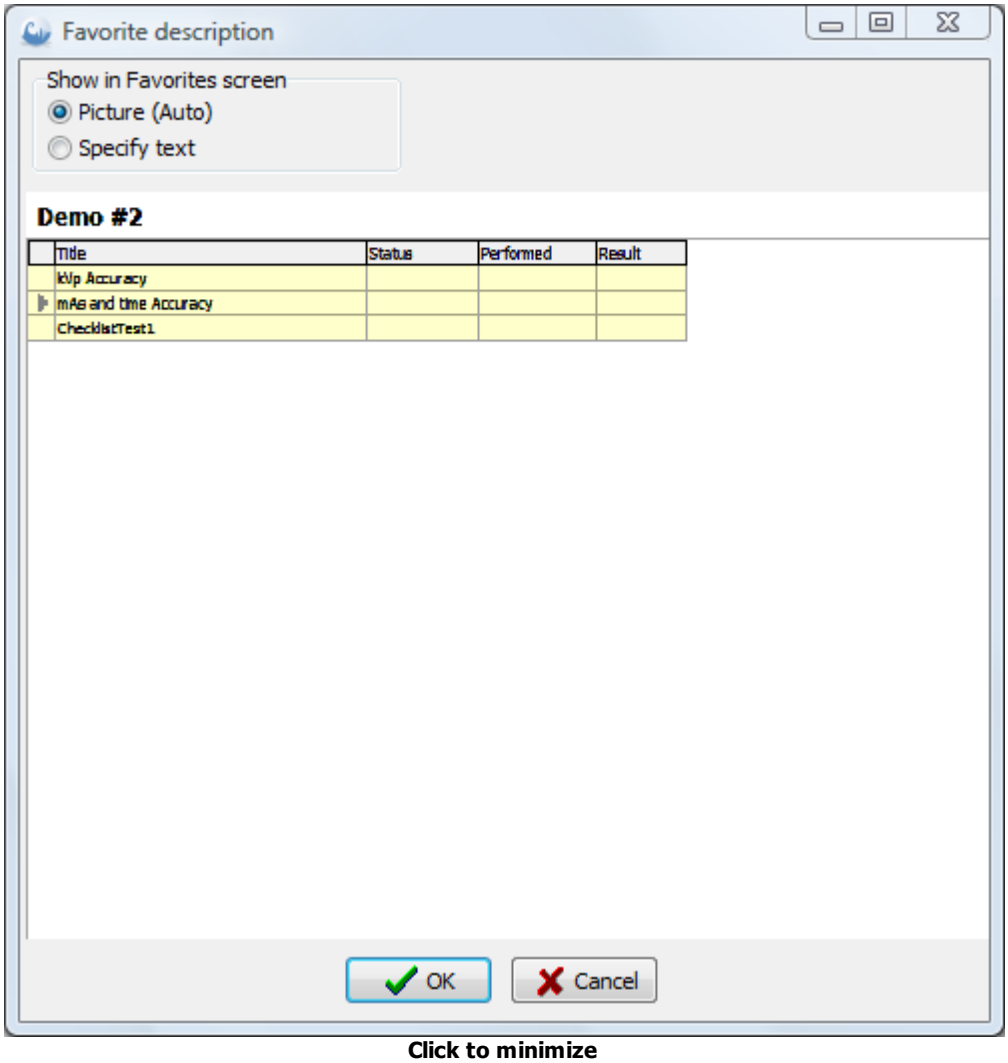
2. Right-click on it.



Click to minimize

3. Select Favorite from the menu.

4. A dialogue is shown:



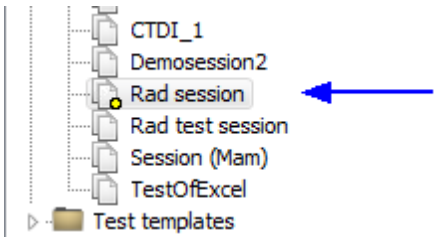
Click to minimize

You can here create a description of your Favorite. This description is shown as Preview in the favorite list. You can chose between:

- An auto generated picture showing the content
- A user-defined text (fully formated text)

Create the type of description you want.

5. Click on OK to finish. The template will now be shown in the favorite list. You can also see in the Library templates that are set as favorites. These templates are indicated with a small black circle:

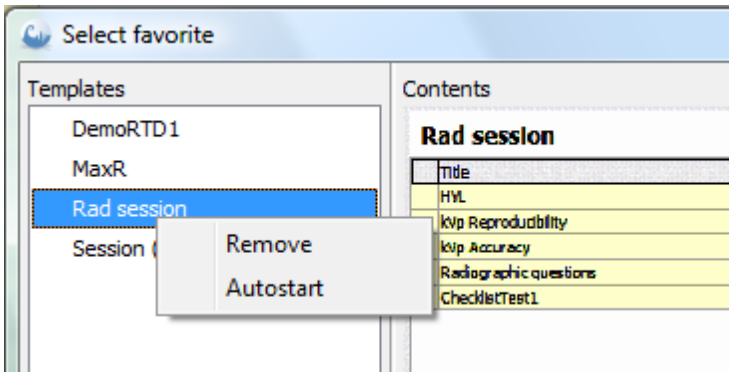


How to remove an item from the favorite list:

1. Click on the Favorite button on the ribbon bar.

2. The Favorite window is shown.

3. Right-click on the template you want to remove from the list:



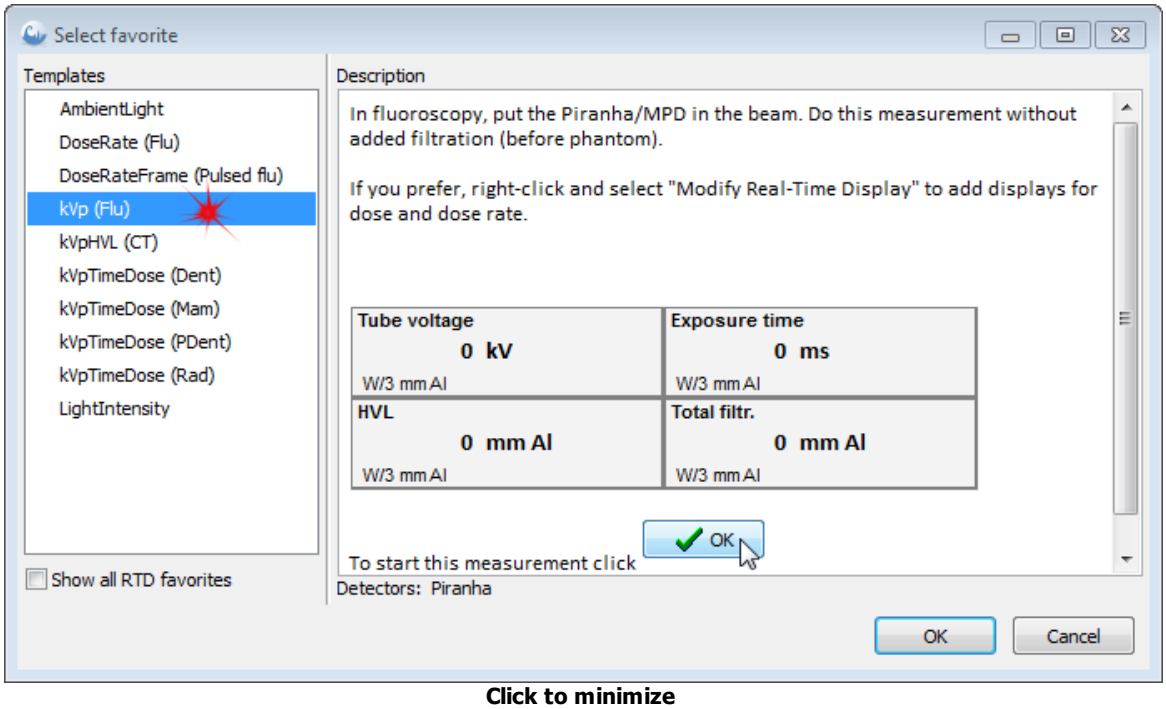
4. Select Remove.

The template is now removed from the favorite list. However, note it still exists in the Library.

How to modify the description for a Favorite

You can edit a Favorite description in the following way:

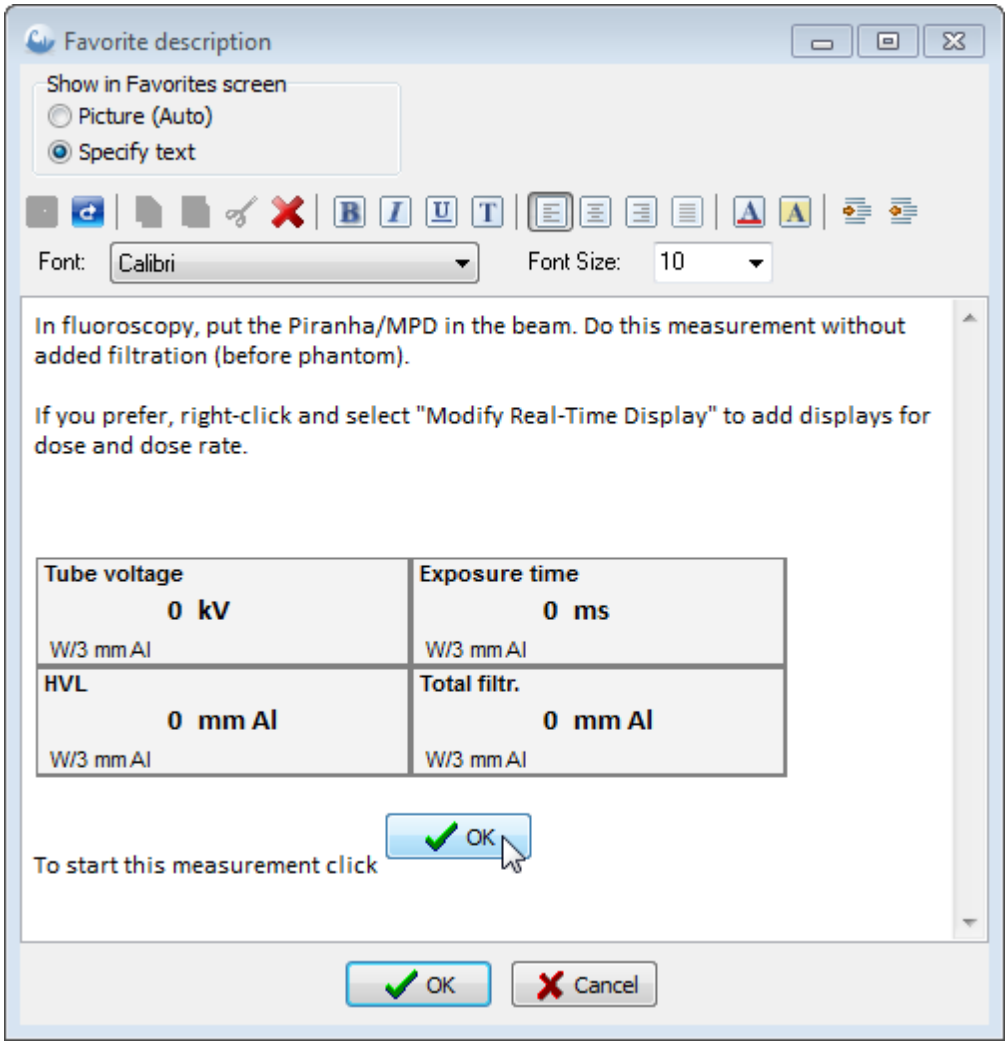
1. Open the Favorite window.



Click to minimize

2. Right-click on the Favorite description you want to edit and select **Edit description**.

3. The window that allows you to edit the description is shown.



Click to minimize

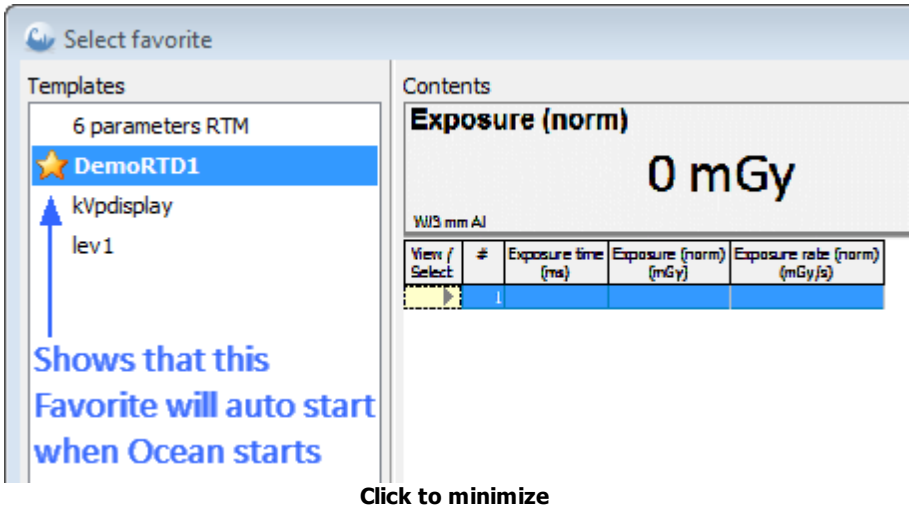
4. Modify the text and click OK to finish.

3.1.10 Auto start and auto connect

Ocean tries to connect to a meter the first time you activate a test or real-time display. It will look for a meter connected to a USB port or the last used Bluetooth port. Keyboard mode is enabled if a meter can't be found. You can do everything in Keyboard mode and enter the data manually. This is the only time Ocean tries to auto connect and if it fails the first time you must click on the Connect button on the ribbon bar to toggle between Connected and Keyboard modes.

If a favorite is set to "Auto start" this favorite is automatically loaded each time Ocean starts. When a favorite is set to "Auto start" and you activate that favorite, Ocean will try to connect to a meter.

Open the Favorite list and right-click on the favorite you want to auto start and click on "Auto start".

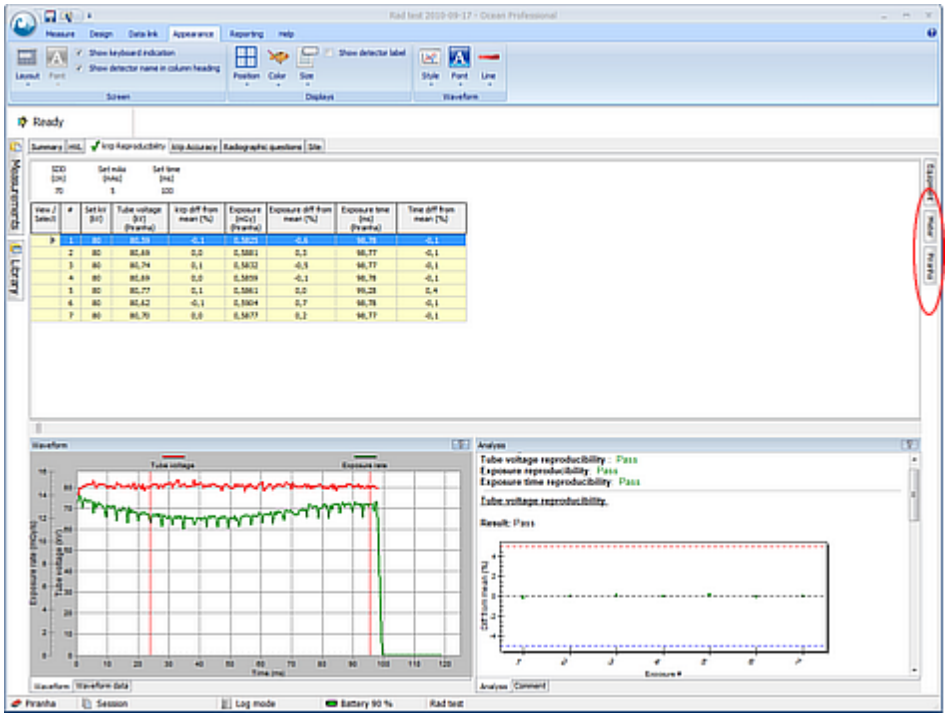


Click to minimize

3.1.11 Meter adjust

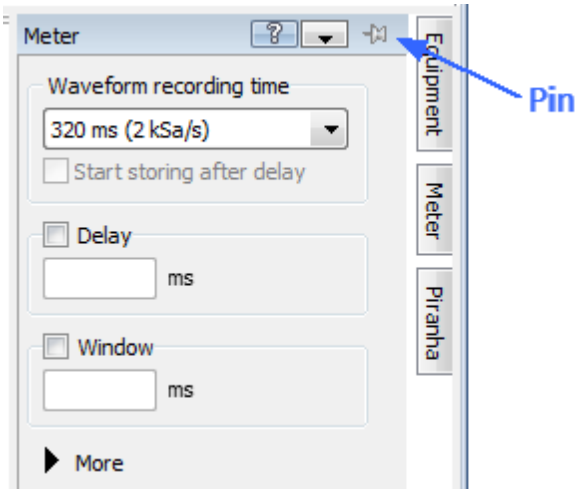
General

All meter settings are found on the tabs to the right. The contents of these tabs are shown when you move the mouse pointer above the tab and "pull" it out.



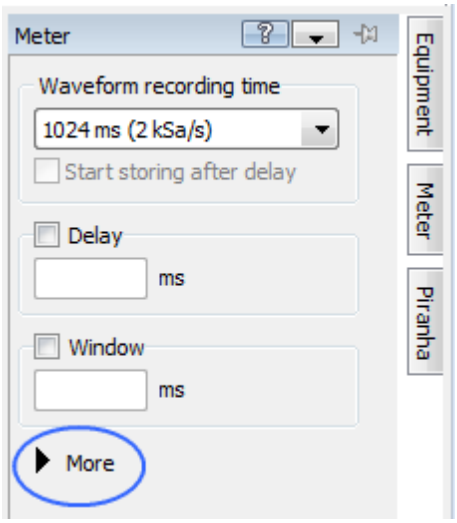
The tab stays open as long as the mouse pointer is kept above the tab content. If you click on the tab, it opens and remains open until you click on some other object in Ocean's main window.

If you want a tab to stay out permanently, you can do this by clicking the "Pin".



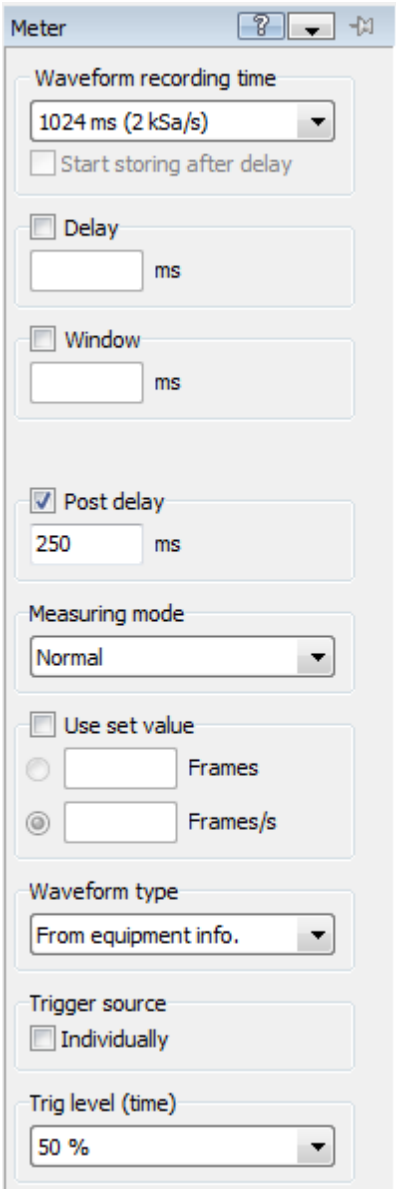
Click to compress

There is a tab called Meter and it contains all of the general meter settings. Additionally, there is a tab for each detector used. Each tab is divided into two parts (one showing the most common meter settings and an extended part showing the not so frequently used meter settings). The picture below shows the settings for the internal Piranha detector (equivalent to the MPD if you are using a Barracuda).



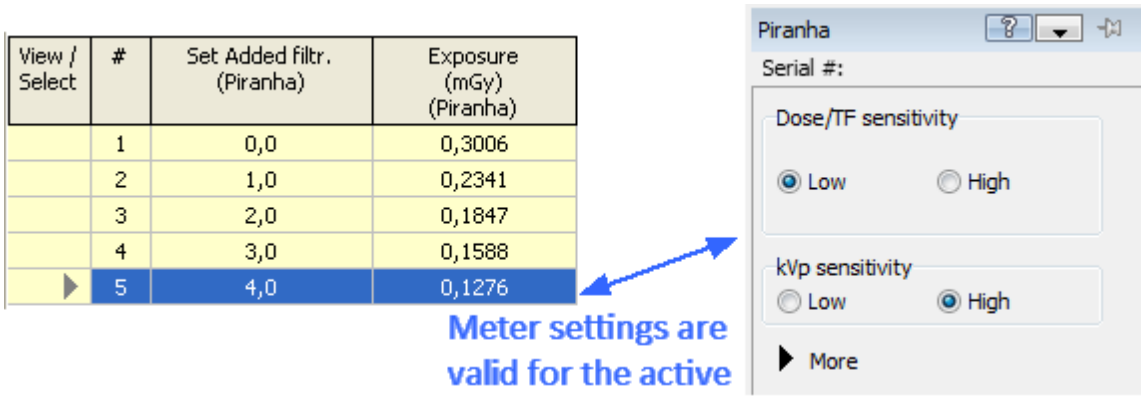
Click to compress

The most frequently used settings are the sensitivity adjustments, and these are shown first. If you want to see more settings for the internal detector, click on "More".



Click to compress

The meter settings you see on the meter tabs to the right are valid for the active row in the grid only. Each row can have its own settings that may be different from the rows above or below it.



Click to compress

The meter settings are saved in the template and will be remembered the next time you repeat the same measurement using the same template.

If you want to apply the same meter settings to several rows, you can do it by following the steps below:

1. Use "multi-select" to select the rows you want the meter settings to apply to. Use Shift+click and Ctrl+click to select multiple rows.
   a) To select a range of rows: click on the first row you want to have in your selection.
   b) Hold down Shift and click on the last row you want to include in your selection.

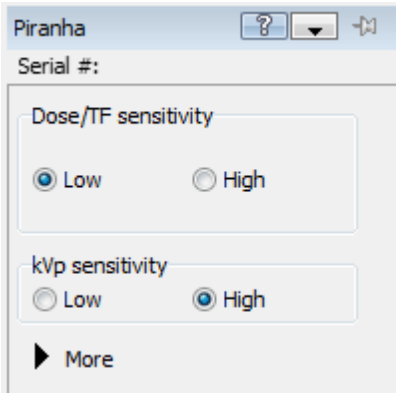
View / Select	#	Set kV (kV)	Tube voltage (kV) (Piranha)	kVp diff %	Exposure (mGy) (Piranha)	Exposure time (ms) (Piranha)
	1	50	49,69	-0,6	0,2070	100,8
	2	55	55,13	0,2	0,2678	112,9
	3	60	60,62	1,0	0,3330	98,27
	4	65	64,33	-1,0	0,3776	98,27
	5	70	69,77	-0,3	0,4390	98,77
▶	6	75	75,42	0,6	0,5179	99,27
	7	80	80,88	1,1	0,5885	98,77
	8	85	84,61	-0,5	0,6444	99,28
	9	90	90,37	0,4	0,7168	98,77
	10	95	95,83	0,9	0,8055	98,77
	11	100	100,89	0,9	0,8833	98,78
	12	105	104,37	-0,6	0,9383	98,77
	13	110	109,57	-0,4	1,022	98,78
	14	115	115,14	0,1	1,115	98,78
	15	120	120,43	0,4	1,195	98,77

You can add more non-consecutive rows to the selection.

2. Hold down Ctrl and click on the rows you want to add.

View / Select	#	Set kV (kV)	Tube voltage (kV) (Piranha)	kVp diff %	Exposure (mGy) (Piranha)	Exposure time (ms) (Piranha)
	1	50	49,69	-0,6	0,2070	100,8
	2	55	55,13	0,2	0,2678	112,9
	3	60	60,62	1,0	0,3330	98,27
	4	65	64,33	-1,0	0,3776	98,27
	5	70	69,77	-0,3	0,4390	98,77
	6	75	75,42	0,6	0,5179	99,27
	7	80	80,88	1,1	0,5885	98,77
	8	85	84,61	-0,5	0,6444	99,28
	9	90	90,37	0,4	0,7168	98,77
	10	95	95,83	0,9	0,8055	98,77
	11	100	100,89	0,9	0,8833	98,78
	12	105	104,37	-0,6	0,9383	98,77
▶	13	110	109,57	-0,4	1,022	98,78
	14	115	115,14	0,1	1,115	98,78
	15	120	120,43	0,4	1,195	98,77

3. Open the Meter adjust tab with the setting(s) you want to change:



4. When you pulled out the tab, the settings presently shown are the settings of the active row (in the case of our example, the active row is #13). To change the Dose/TF sensitivity of all rows, first change the Dose/TF sensitivity to "High" and then back down to "Low".

The Dose/TF sensitivity of all the selected rows have now been set to "Low".

NOTE! If you use more than one detector and you use **Very High Sensitivity** for one detector but not for all, waveforms will not be shown correctly.

Meter adjust between exposures

Between each exposure is the meter adjusted if needed. This requires normally that no signal is present when you move from one row to another in the grid and when moving to the next exposure (measurement) in a real-time display. It may sometimes be desirable to go from one measurement to another without turning of the "signal" you are measuring. For example, when you use the light probe and measure ambient light, the signal is on all the time unless you darken the light detector (for example in your hand). If meter has exactly the same settings for two rows, no meter adjustments are done when moving from one row to another. If this is the case you may ignore to turn off the exposure when moving to the next row. When you have a message saying "Please turn off exposure and press Alt+X" you may ignore to turn off exposure. However, this can only be done when you are sure that meter settings are exactly the same for the next row.
One situation when no signal from the detector is allowed is when you activate a test or real-time display. At this point, no signal from the detector(s) you are going to use are not allowed.

Description of the different Meter adjust tabs

Meter - General settings for the meter

Settings	Description
Waveform recording time	Select the waveform recording time.
Measurement time	Measuring time when Timed mode is used.
Moving average length	Moving average time when Free run mode is used.
Delay	Add a delay after the detection of trig before measurement of kVp starts
Window	If a time is specified, kVp is measured during the window time (starts after the delay)
Post delay	This is the time the meter waits after trig of before it assumes that the exposure is finished. The post delay must be set to a time longer than any dead time in the radiation.
Measuring mode	You can select between Normal, Timed or Free run Normal =use this measuring mode for exposures and fluoroscopy Timed = meter measures during a specific time Free run = meter measures continuously without use of any trig levels (for more details see the meter manual)
Use set values for "Frames" and "Frames/s"	This can be used when measuring pulsed radiation. Normally the meter is measuring the frames and/or the frame rate. The measured value is used when calculating dose/frame. In cases when the meter is not able to detect the

	radiation pulses (very low signal) a set value can be used instead when calculating dose/frame.
Waveform type	This is normally set to "From equipment info." In this case the waveform type is taken from the equipment info tab.
Trigger source	This can be set to "Individual" for special circumstances. In this case each detector will trig on its own signal. Default is unchecked and all detectors start to measure when the internal detector receives a signal.
Trig level	Trig level for the exposure time measurement (Normally set to 50%).

-End-

Pirahna or Barracuda MPD - Settings for the internal kVp and dose detector

These are settings for the Piranha internal detector or the MPD when Barracuda is used.

Settings	Description
Dose/TF sensitivity	Senstivity setting for the dose and total filtration measurement (internal detector).
kVp sensitivity	Senstivity setting for the kVp detector (internal detector)
Calibration	Available calibrations for the internal detector and current application. (can be present as a column as well, and if this is the case it is not shown here)
kV range	kV range, normally set to "Auto". In this case,kVp range is selected depending on the kVp set value specified in Ocean.
Use TF from equipment info.	Normally unchecked. In this case, the total filtration is measured automatically by the meter. If the meter is not capable of measuring the total filtration (very low signals) the information can be taken from the equipment information.
Added filtration	This field is disabled if meter measures the total filtration. Any added filtration will be included in the total filtration value the meter measures. If the meter is set to not measure the total filtration, any added filtration must be specified here. (can be present as a column as well, and if this is the case it is not shown here)
Beam correction factor	An optional factor that is used for the internal dose and dose rate value. Any measured value is multiplied with this factor. This can be used to specify the scatter factor. (can be present as a column as well, and if this is the case it is not shown here)

-End-

Pirahna Dose Probe or R100B - Settings for external solid state detectors

These settings are valid for the Piranha Dose Probe, R100B or any other solid state dose detector.

Settings	Description
Sensitivity	Sensitivity setting for the electrometer used for the detector.
Calibration	Available calibrations for current detector and current application. (can be present as a column as well, and if this is the case it is not shown here)
Beam correction factor	An optional factor that is used for the internal dose and dose rate value. Any measured value is multiplied with this factor. This can be used to specify the scatter factor. (can be present as a column as well, and if this is the case it is not shown here)
Added filtration	This field is disabled if meter measures the total filtration. Any added filtration will be included in the total filtration value the meter measures. If the meter is set to not measure the total filtration, any added filtration must be specified here. (can be present as a column as well, and if this is the case it is not shown here)
Trigger threshold	Trigger threshold for the detector. Can be increased to avoid noise or lowered to increase sensitivity.

-End-

Ion chambers - Settings for ion chambers (Barracuda only)

These settings are valid for the ion chambers used with the Barracuda.

Settings	Description
Sensitivity	Sensitivity setting for the electrometer used for the detector.
Calibration	Available calibrations for current detector and current application. (can be present as a column as well, and if this is the case it is not shown here)
Beam correction factor	An optional factor that is used for the internal dose and dose rate value. Any measured value is multiplied with this factor. (can be present as a column as well, and if this is the case it is not shown here)
Added filtration	This field is disabled if meter measures the total filtration. Any added filtration will be included in the total filtration value the meter measures. If the meter is set to not measure the total filtration, any added filtration must be specified here. (can be present as a column as well, and if this is the case it is not shown here)
Trigger threshold	Trigger threshold for the detector. Can be increased to avoid noise or lowered to increase sensitivity.

Ocean makes sure that bias is turned on when needed and turned off when not needed. There is also a button on the ribbon bar to turn off the bias manually.

-End-

mAs probes of type MAS-1 and MAS-3 - Settings for mAs probes

These settings are valid for the Piranha Dose Probe, R100B or any other solid state dose detector.

Settings	Description
Sensitivity	Sensitivity setting for the electrometer used for the detector.
Trigger threshold	Trigger threshold for the detector. Can be increased to avoid noise or lowered to increase sensitivity.

-End-

mAs probes of type MAS-2 - Settings for mAs probes

These settings are valid for the Piranha Dose Probe, R100B or any other solid state dose detector.

Settings	Description
Trigger threshold	Trigger threshold for the detector. Can be increased to avoid noise or lowered to increase sensitivity.

-End-

Light detector - Settings for light probe

These settings are valid for the Piranha Light Probe or L100/L100B.

Settings	Description
Sensitivity	Sensitivity setting for the electrometer used for the detector.
Trigger threshold	Trigger threshold for the detector. Can be increased to avoid noise or lowered to increase sensitivity.

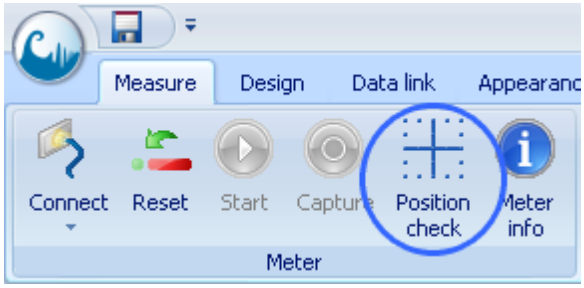
-End-

3.1.12 Position check

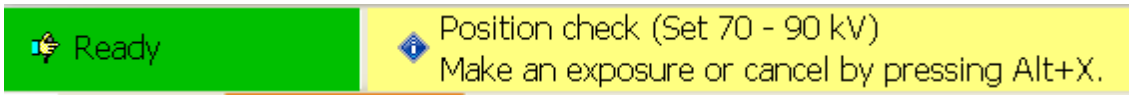
Position check is used to verify that the meter (Barracuda and Piranha) is correctly positioned in the beam.

To do a manual position check:

1. Click on the button on the ribbon bar:



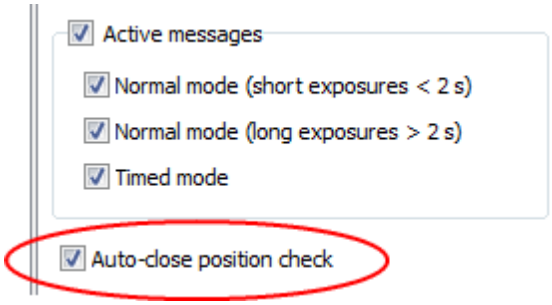
2. The status bar is showing the following:



Click to compress

3. Follow the instructions on the status bar.

By default positon check closes automatically when successful. You can turn off this in Program options -> Meter preferences:



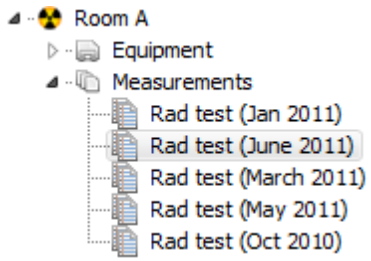
It is also possible to use a forced position check. A forced position check is set in the template and Ocean will automatically ask you to perform a position check.

3.1.13 Trending

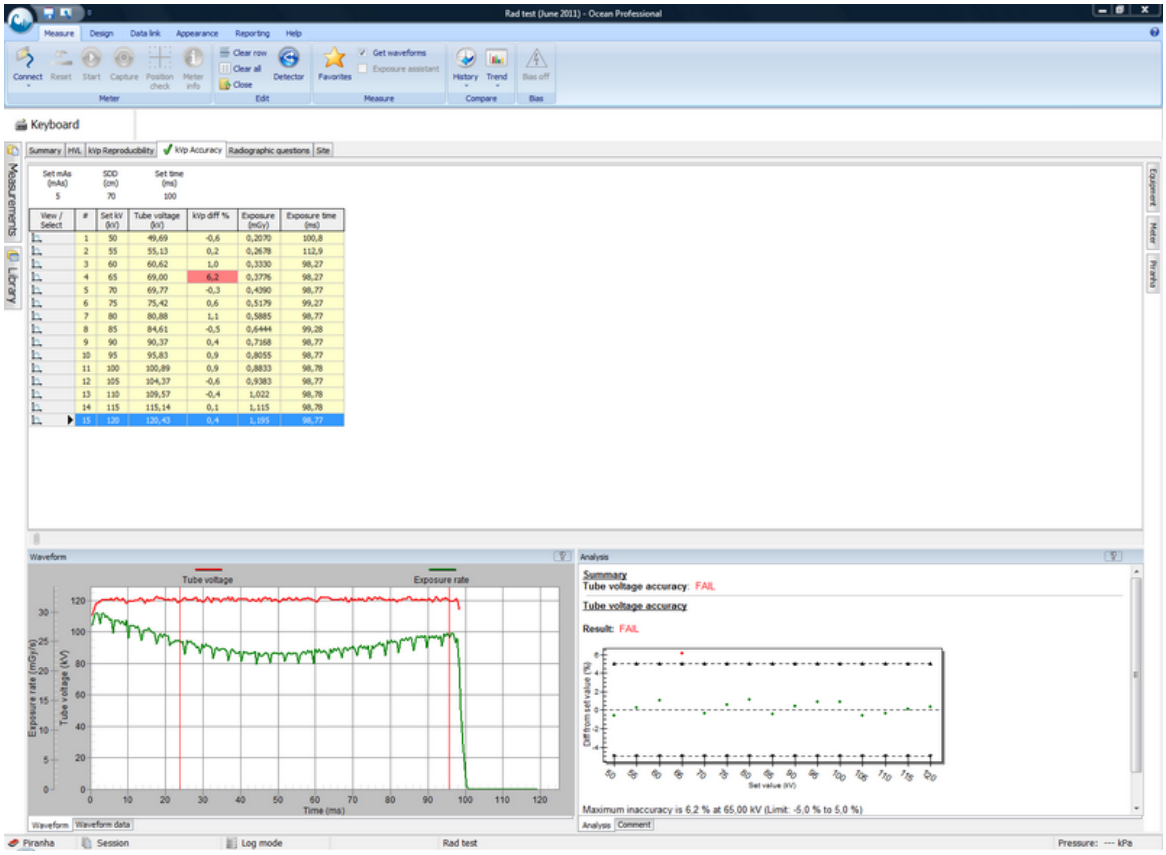
Trending is used to compare how a certain parameter change over time. You can do instant trending at any time and you can also add trending to a test and get the result in your report. The trend analysis is based on the equipment in the room you are currently working in.

To do trend analysis:

1. Assume that you have done repeated measurements over time in a room.

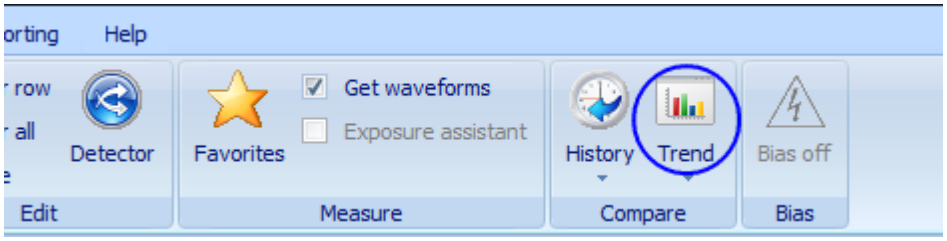


2. You are working with the session from June 2011 and you want to see how the tube voltage accuracy is changing over time. Activate the kVp accuracy test.



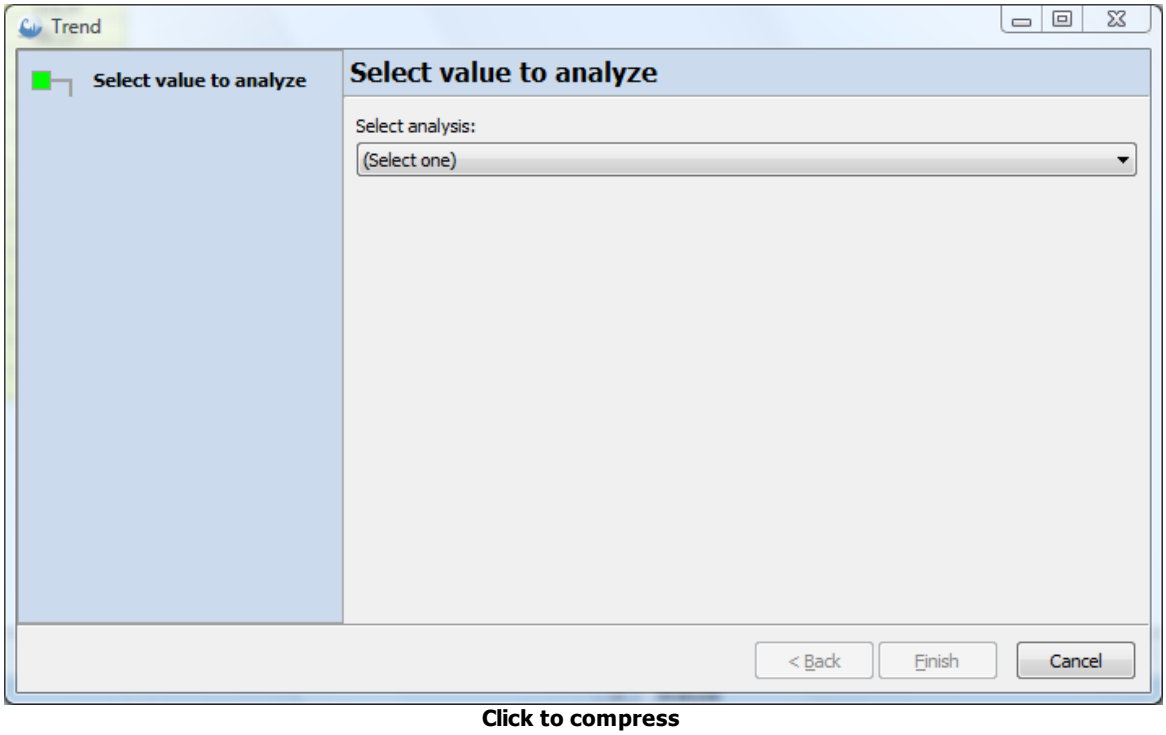
Click to compress

3. Now click on the Trend button (select New if a menu is sub shown) on the ribbon bar.



Click to compress

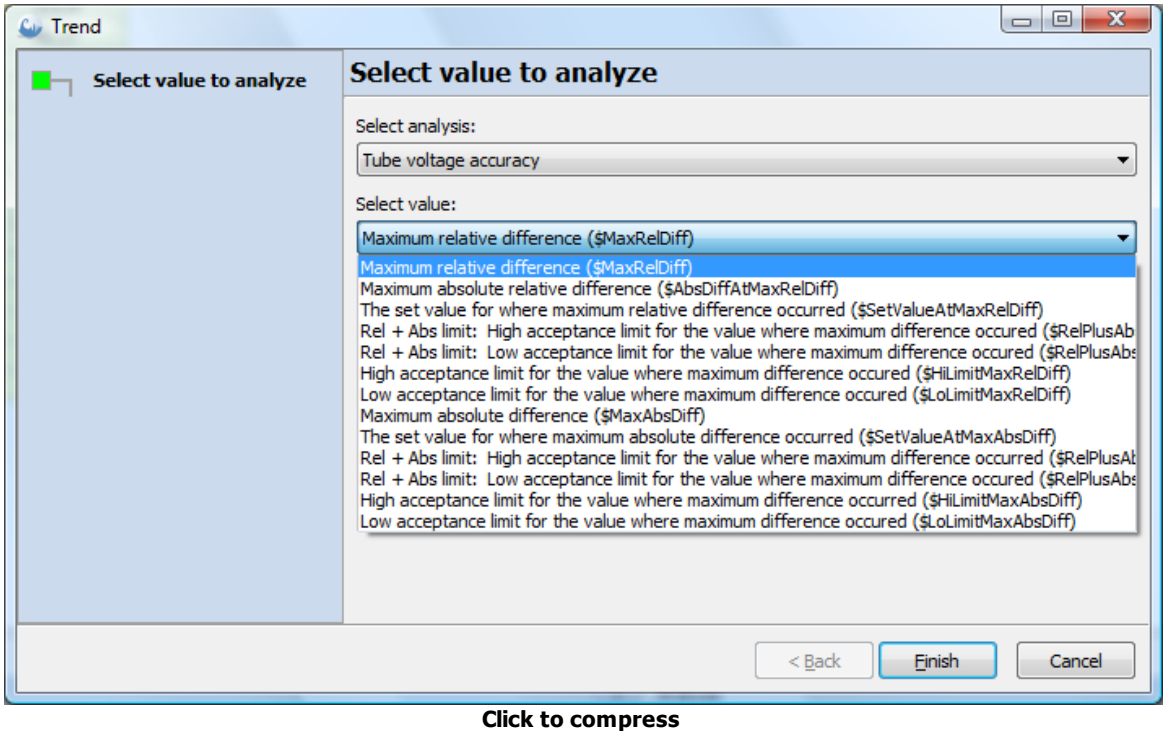
4. The Trend wizard is started to help you to create the trend analysis.



Click to compress

5. First select which analysis you want to do trend analysis for. The drop-down list will show all analysis that are used in the current test.

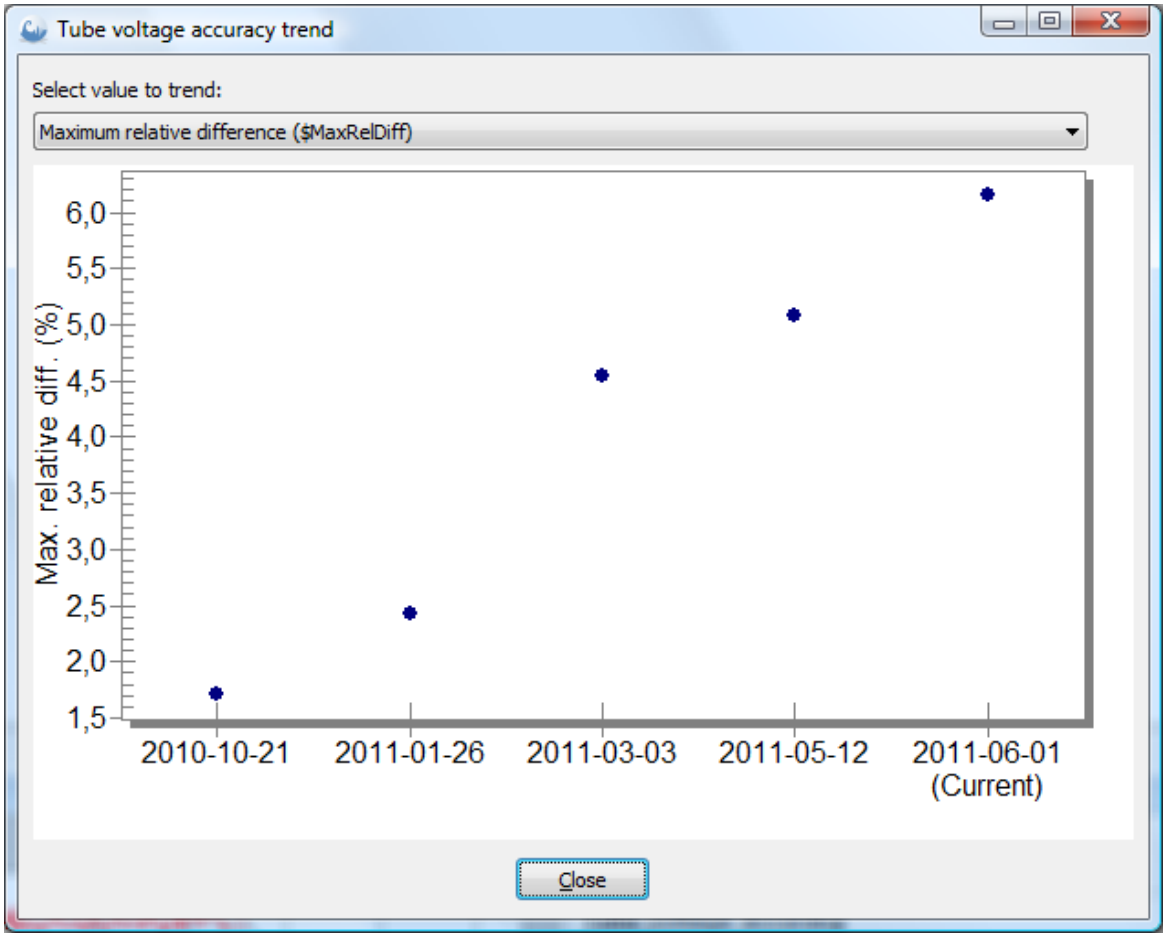
6. When you have selected an analysis you can select which parameter you want to see the trend for. In this case we want to study maximum relative difference.


Trend
Select value to analyze
Select value to analyze
Select analysis:
Tube voltage accuracy
Select value:
Maximum relative difference ($MaxRelDiff)
Maximum relative difference ($MaxRelDiff)
Maximum absolute relative difference ($AbsDiffAtMaxRelDiff)
The set value for where maximum relative difference occurred ($SetValueAtMaxRelDiff)
Rel + Abs limit: High acceptance limit for the value where maximum difference occured ($RelPlusAb
Rel + Abs limit: Low acceptance limit for the value where maximum difference occured ($RelPlusAbs
High acceptance limit for the value where maximum difference occured ($HiLimitMaxRelDiff)
Low acceptance limit for the value where maximum difference occured ($LoLimitMaxRelDiff)
Maximum absolute difference ($MaxAbsDiff)
The set value for where maximum absolute difference occurred ($SetValueAtMaxAbsDiff)
Rel + Abs limit: High acceptance limit for the value where maximum difference occurred ($RelPlusAb
Rel + Abs limit: Low acceptance limit for the value where maximum difference occured ($RelPlusAbs
High acceptance limit for the value where maximum difference occured ($HiLimitMaxAbsDiff)
Low acceptance limit for the value where maximum difference occured ($LoLimitMaxAbsDiff)
< Back
Finish
Cancel

Click to compress

7. Select "Maximum relative difference" and click on Finish.

8. The trend for the relative difference is now shown. Ocean will look for all kVp accuracy analysis done in this room for the same generator.



Click to compress

You can now see how the maximum relative difference for the tube voltage is changing over time. You can easily look at another parameter from the drop-down list at the top of the window.

9. Click on the Close button to close the trend window.

10. If you want to see the same trend again just click on the upper part of the Trend button on the ribbon bar. If you click on the lower part - select View from the sub menu.

11. If you want to see the trend results from another analysis, click on the lower part of the trend button and select New.

If you want to include trend analysis in your report please refer to the topic Add trend analysis.

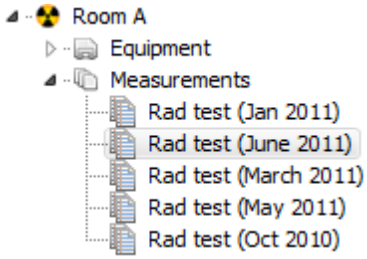
3.1.14 History

History is used to quickly find similar measurements done before in the same room as you currently are working in. You can also use the History function to find a previous measurement and copy an old test into the session you are currently working with.

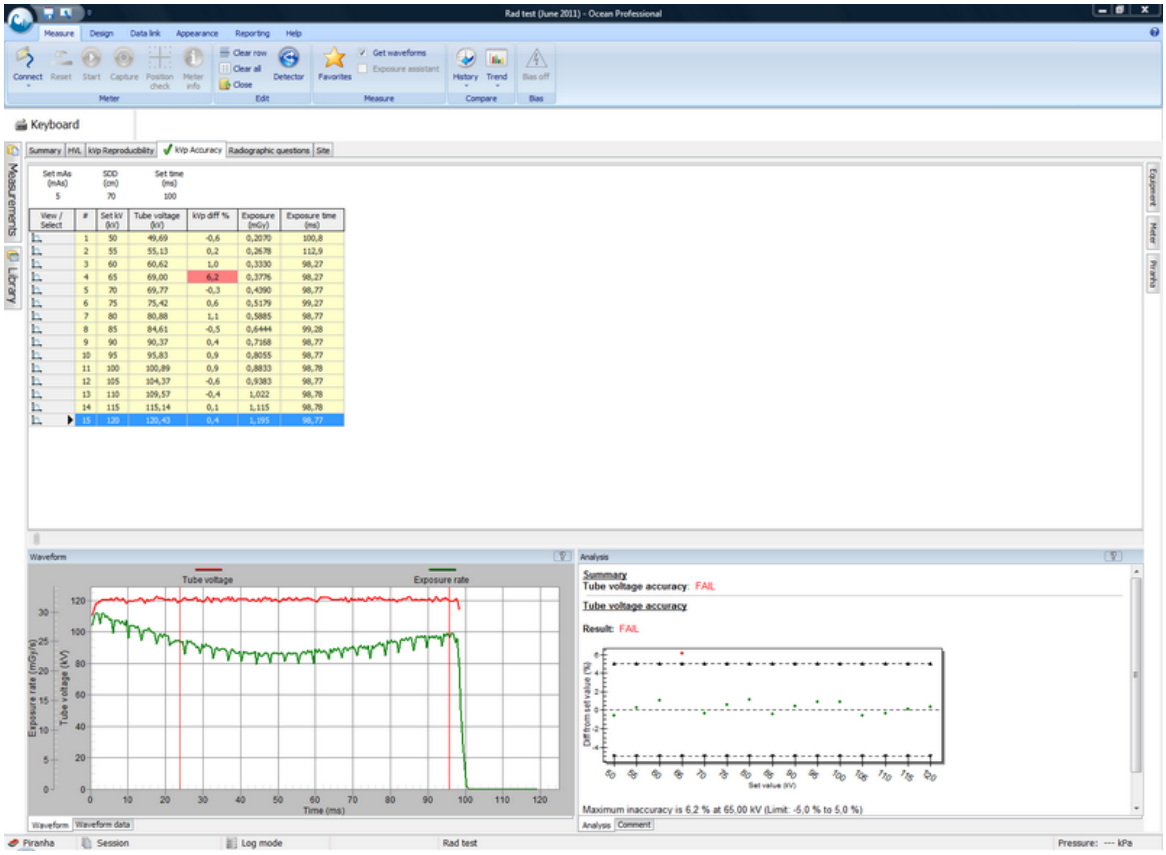
View previous measurements

To view previous measurements:

1. Assume that you have done repeated measurements over time in a room.

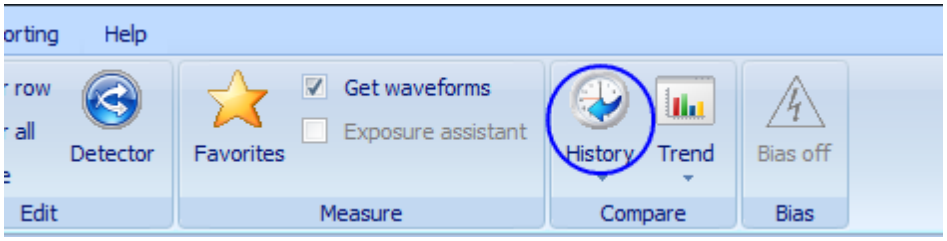


2. You are working with the session from June 2011 and you want to see how the tube voltage accuracy analysis you have done before. Activate the kVp accuracy test.



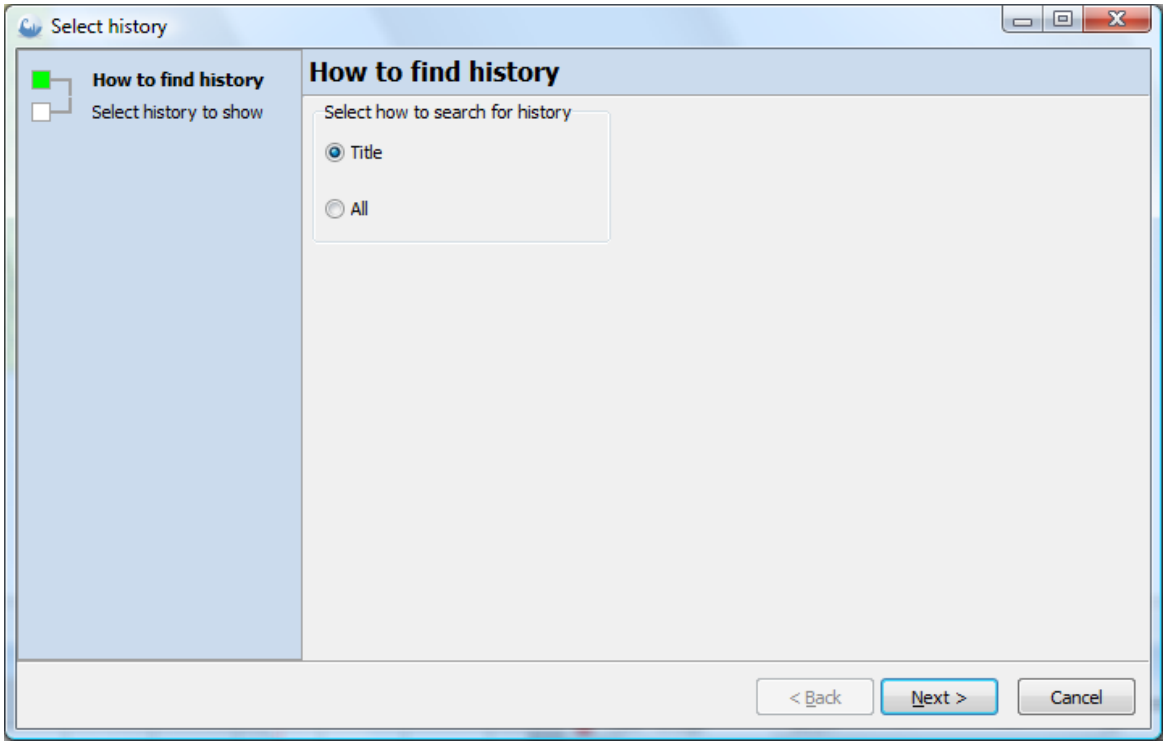
Click to compress

3. Now click on the History button (select New if a menu is sub shown) on the ribbon bar.



Click to compress

4. A wizard starts to help you select what to look at:



Click to compress

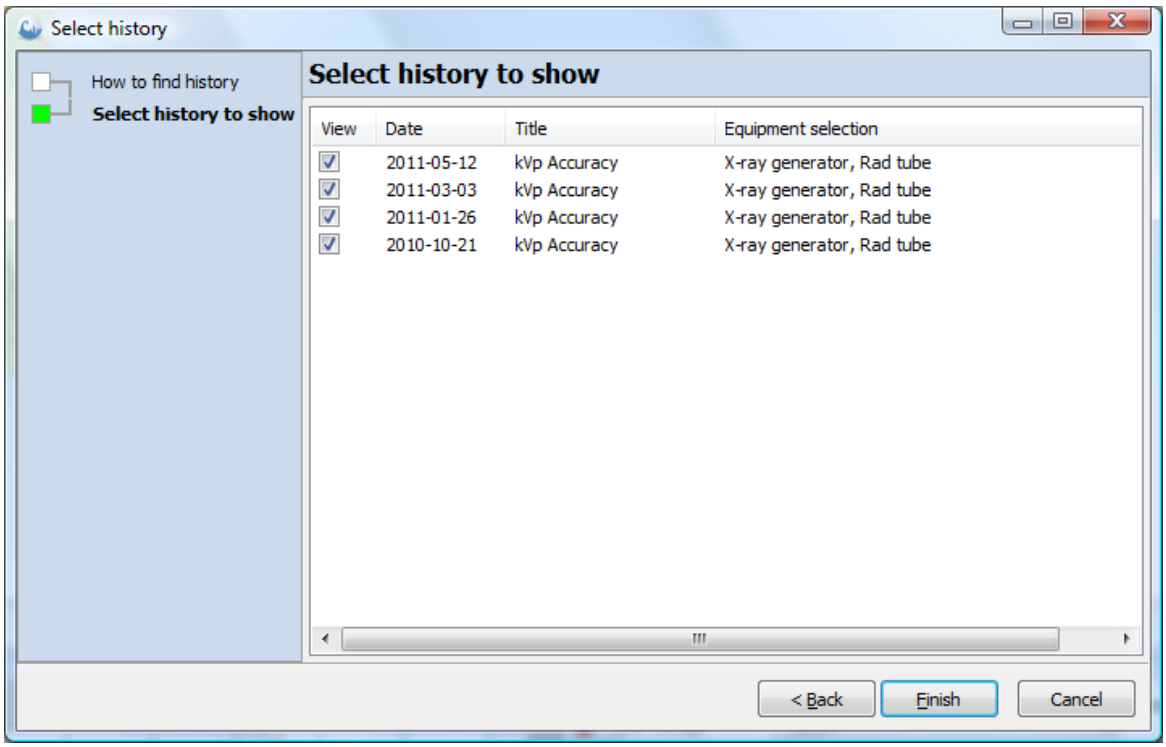
5. You can chose how to filter out tests to show:

Title - all tests with the same title as the current test will be shown

All - you can chose from a list showing all tests done in this room.

6. Assume that you want to see the tests with the same title. Click Next.

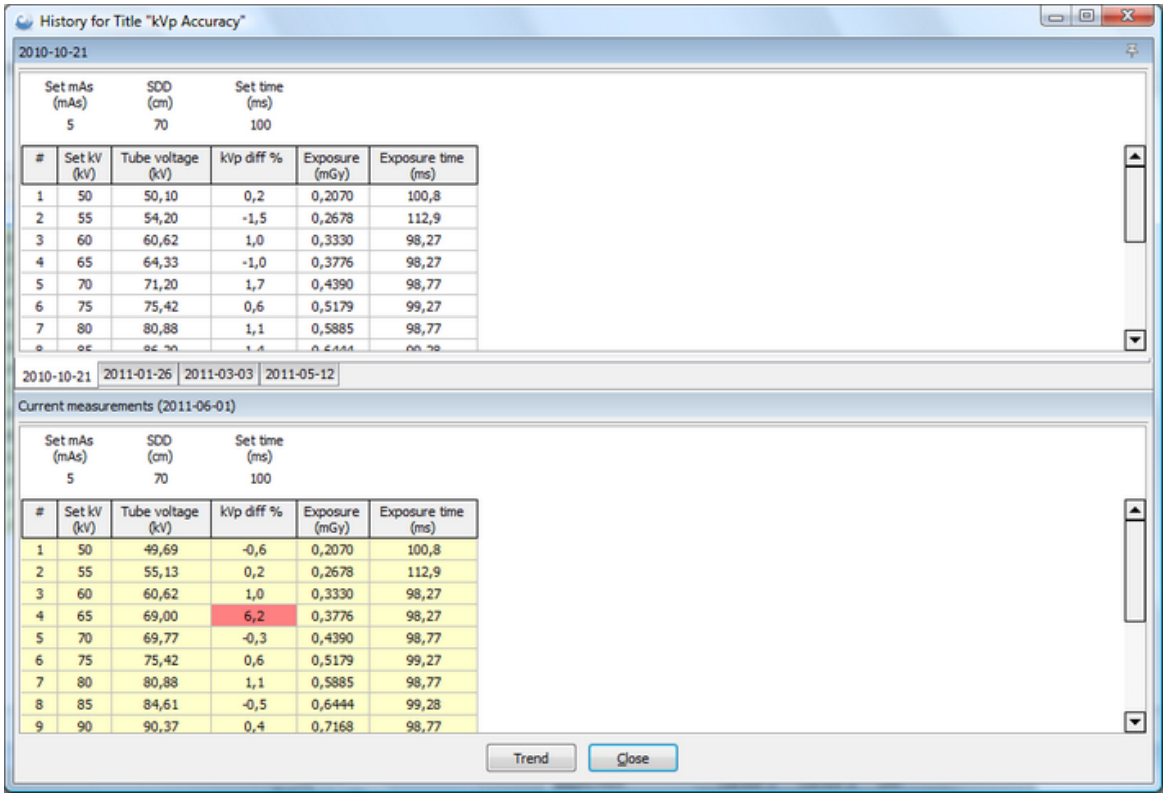
7. A list with all tests with the same name is now shown.



Click to compress

8. You can here exclude tests if you want. When you are ready click on Finish.

9. A window is now opened that shows all your selected tests.

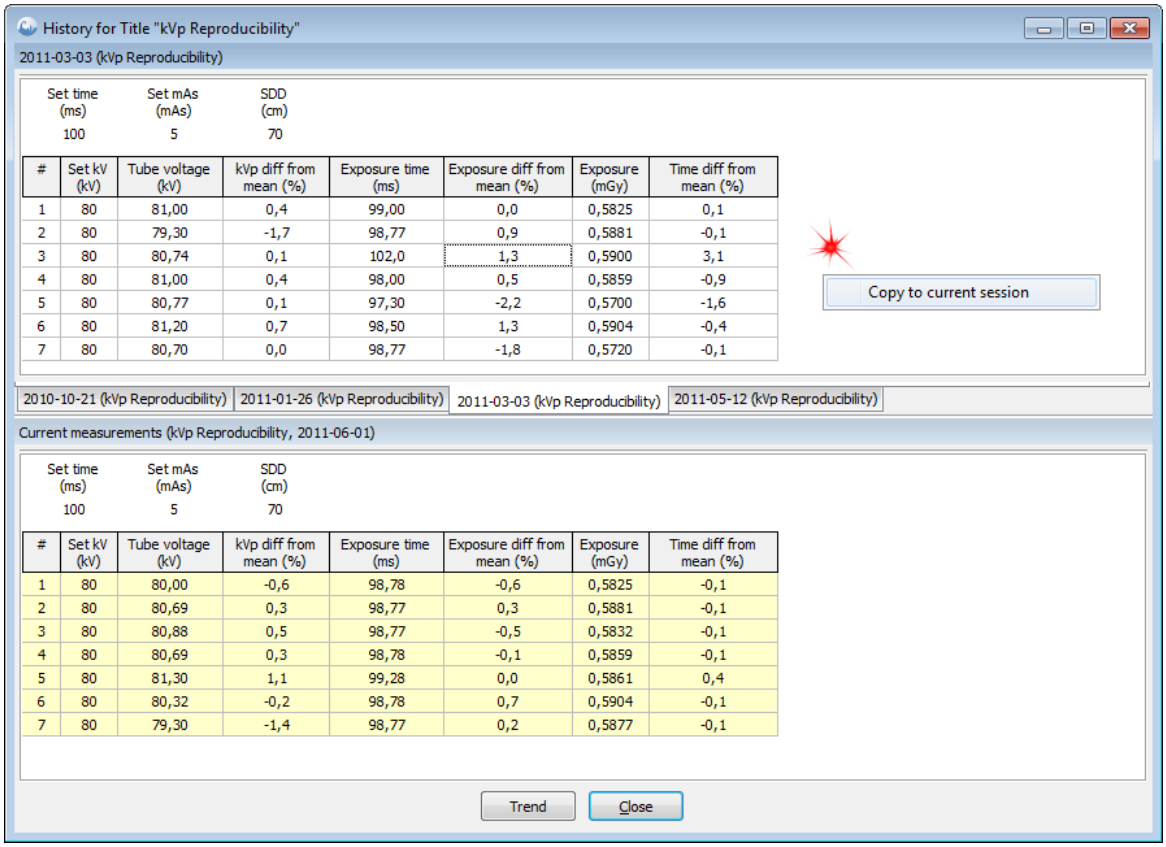


Click to compress

10. In the upper part you have all your old tests and in the lower is the current test shown.

Copy a test or checklist from history

1. Right-click outside the grid in the history window.


History for Title "kVp Reproducibility"
2011-03-03 (kVp Reproducibility)
Set time (ms) 100
Set mAs (mAs) 5
SDD (cm) 70
| Set kV (kV) | Tube voltage (kV) | kVp diff from mean (%) | Exposure time (ms) | Exposure diff from mean (%) | Exposure (mGy) | Time diff from mean (%)
1 | 80 | 81,00 | 0,4 | 99,00 | 0,0 | 0,5825 | 0,1
2 | 80 | 79,30 | -1,7 | 98,77 | 0,9 | 0,5881 | -0,1
3 | 80 | 80,74 | 0,1 | 102,0 | 1,3 | 0,5900 | 3,1
4 | 80 | 81,00 | 0,4 | 98,00 | 0,5 | 0,5859 | -0,9
5 | 80 | 80,77 | 0,1 | 97,30 | -2,2 | 0,5700 | -1,6
6 | 80 | 81,20 | 0,7 | 98,50 | 1,3 | 0,5904 | -0,4
7 | 80 | 80,70 | 0,0 | 98,77 | -1,8 | 0,5720 | -0,1
Copy to current session
2010-10-21 (kVp Reproducibility)
2011-01-26 (kVp Reproducibility)
2011-03-03 (kVp Reproducibility)
2011-05-12 (kVp Reproducibility)
Current measurements (kVp Reproducibility, 2011-06-01)
Set time (ms) 100
Set mAs (mAs) 5
SDD (cm) 70
| Set kV (kV) | Tube voltage (kV) | kVp diff from mean (%) | Exposure time (ms) | Exposure diff from mean (%) | Exposure (mGy) | Time diff from mean (%)
1 | 80 | 80,00 | -0,6 | 98,78 | -0,6 | 0,5825 | -0,1
2 | 80 | 80,69 | 0,3 | 98,77 | 0,3 | 0,5881 | -0,1
3 | 80 | 80,88 | 0,5 | 98,77 | -0,5 | 0,5832 | -0,1
4 | 80 | 80,69 | 0,3 | 98,78 | -0,1 | 0,5859 | -0,1
5 | 80 | 81,30 | 1,1 | 99,28 | 0,0 | 0,5861 | 0,4
6 | 80 | 80,32 | -0,2 | 98,78 | 0,7 | 0,5904 | -0,1
7 | 80 | 79,30 | -1,4 | 98,77 | 0,2 | 0,5877 | -0,1
Trend
Close

Click to compress

2. Select **Copy to current session** from the menu.

3. The selected test or checklist is now copied into the session you work with.

Trend

You can do trend analysis directly in two different ways from the history window.

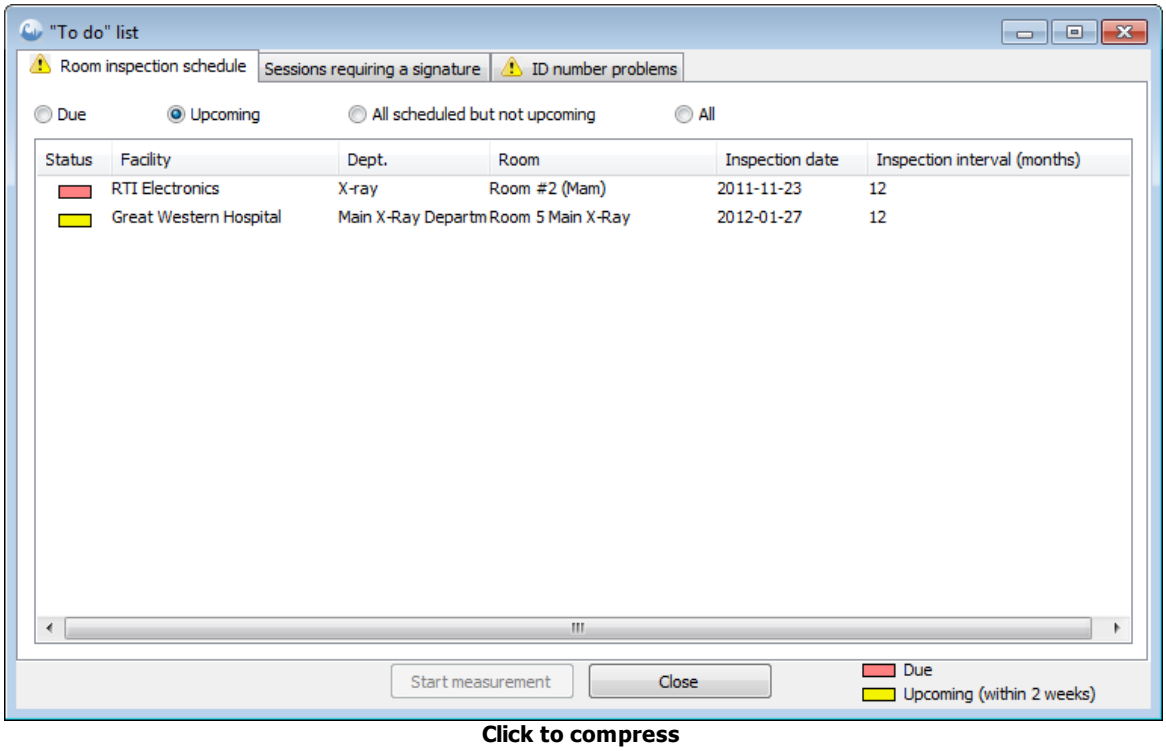
- You can click on the Trend button and set up trend in the same way as described in topic Trending.
- You can right-click in a cell and select Trend to look at the trend for a specific value.

3.1.15 To do list

If you are specifying inspection dates for your rooms, they will appear in the To do list and you will be notified when it is time for inspection.

NOTE: The Scheduling function may not be available if:

- Ocean Central is used and it is decided that inspection dates are controlled from the server.
- Scheduling is not enable in the Program options.



Click to compress

You can sort the list by clicking on the column headings. There are three different tabs:

Room inspection schedule
Here are all due and upcoming rooms listed.

Sessions requiring signature
If the report template for a session says "Signature required", sessions not signed are listed here.

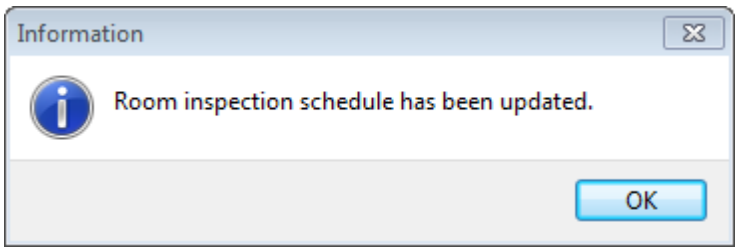
ID number problems
This tab is only shown if ID's are used to identify facilities/departments/room and equipment. Here are objects that are missing ID shown.

3.1.16 Update inspection dates

If you are setup to use Ocean Central and it is decided that inspection dates are set centrally (from server), this button is enabled. Click the button to update your local inspection dates:

1. Click on the button.

2. Wait until the process is finished. A message is shown:



3. Click OK to finish.

4. The To do list will now show all dates and any upcoming or due inspections will be marked.

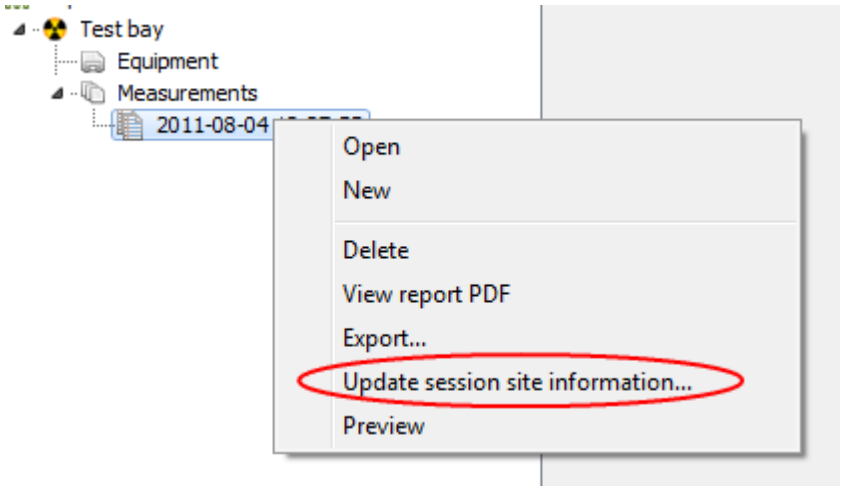
3.1.17 Update session site nformation

It is possible to update the site information in a session that is started and/or finished. This may be needed if the site information in the database was incorrect or incomplete when the measurement was done (that is when the session was started). In this case you may want to complement/correct the site information in the database and after that update all session. To do this:

1. Locate the session you want to update the site information for.

2. Right-click on it.

3. Select "Update session site information..." from the menu.



Click to compress

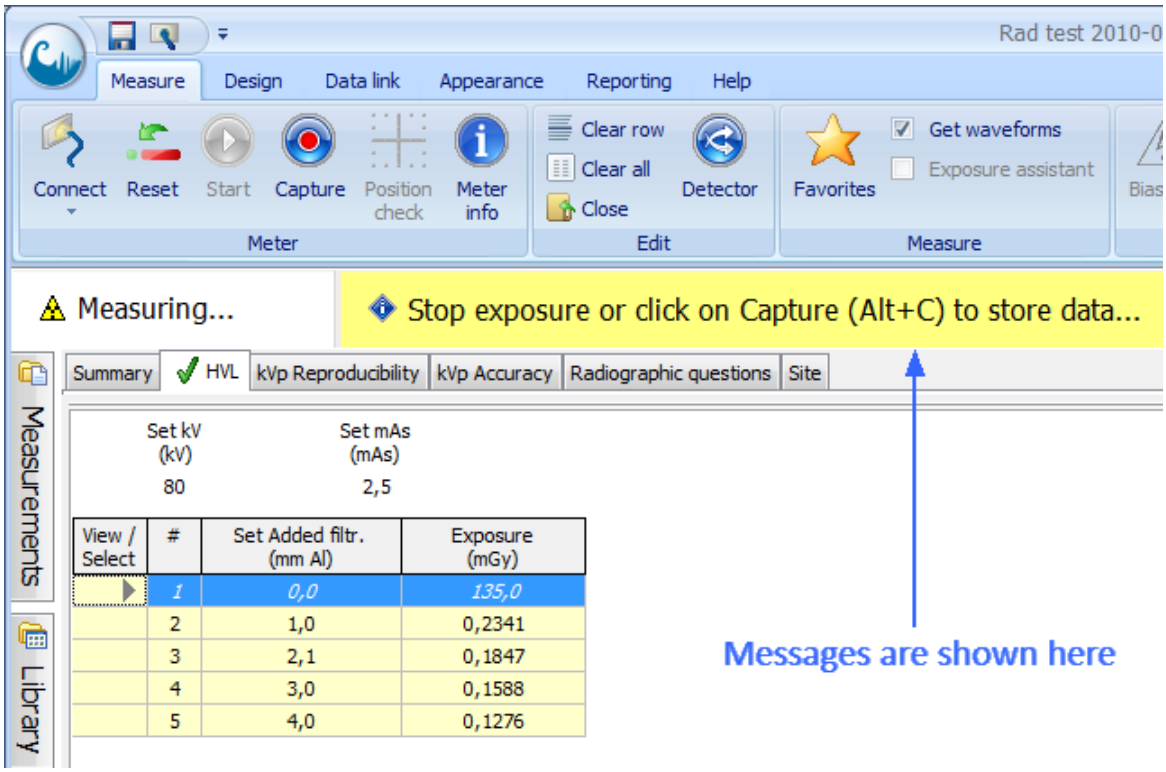
4. A dialogue box is shown. Click OK to accept or Cancel to abort.

3.1.18 Different measuring modes

There are three different measuring modes available using the Piranha and Barracuda. They are as follows:

Measuring mode	Description and use
Normal	The Normal mode is used for short and long (fluoro) exposures. In this mode, your meter will sense automatically if there is a signal and when it is above a certain trigger level. If the signal is long, the displays/grid will be updated with new data every 2 seconds data. If the signal is short, the results are displayed after trigger is off.
Free run	The free run mode has no trigger level. As soon as the meter is told to begin measuring, it starts to measure even if there is no signal. This measuring mode is useful when the signal you want to measure is very low. Free run is recommended for light measurements, especially when measuring "ambient" light (when no shutter is present).
Timed	The Timed mode setting measures during a pre-defined time period. Measurements in Timed mode must be started manually. This measuring mode is very useful when you want to measure a very low signal. You can use the "very high" sensitivity setting in Timed mode and it will further improve the meter's capability to measure very low signals.

The Message bar is used during measuring to assist you to collect data most efficiently:



Click to minimize

Important!

Read the "yellow" messages carefully and follow the instructions. This will ensure that you can maximize your productivity and collect data quickly and correctly.

3.1.18.1 Normal

This is the measuring mode you will use most frequently. It can be used for both short and long (fluoro) exposures. In this mode, the meter functions fully automatically. It will sense from the detector when there is an exposure and will start and stop the measurement automatically.

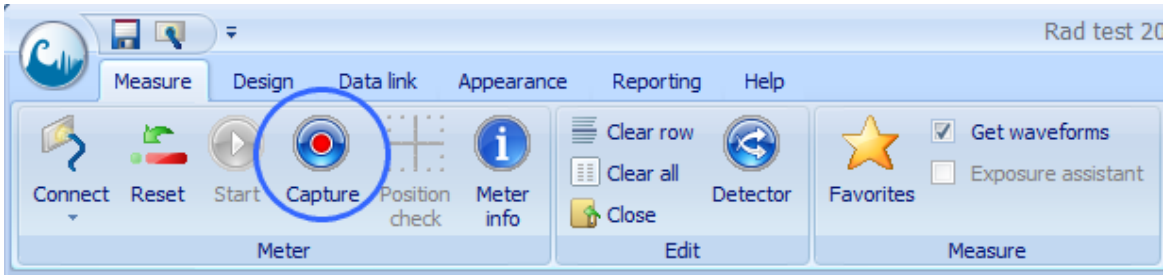
Short exposure (<2 seconds): Results are shown in the grid and the displays as soon as trigger is off.

Long exposure (>2 seconds): If the exposure is long the grid and displays are updated with new data every 2 seconds. Italic font is used in the grid to indicate an ongoing exposure.

View / Select	#	Exposure (norm) (mR)	Exposure time (ms)	Exposure rate (norm) (R/min)
	1	22810	2962	462,1
	2	5596	658,4	510,0
	3	*51930*	*6056*	*509,0*
	4			
	5			
	6			
	7			

As soon as the exposure is terminated, the final data is shown in the grid with normal font, and the meter is prepared for the next measurement. The cursor is moved to the next row in the grid.

It is possible to capture the data by clicking the capture button during a long exposure.



Click to minimize

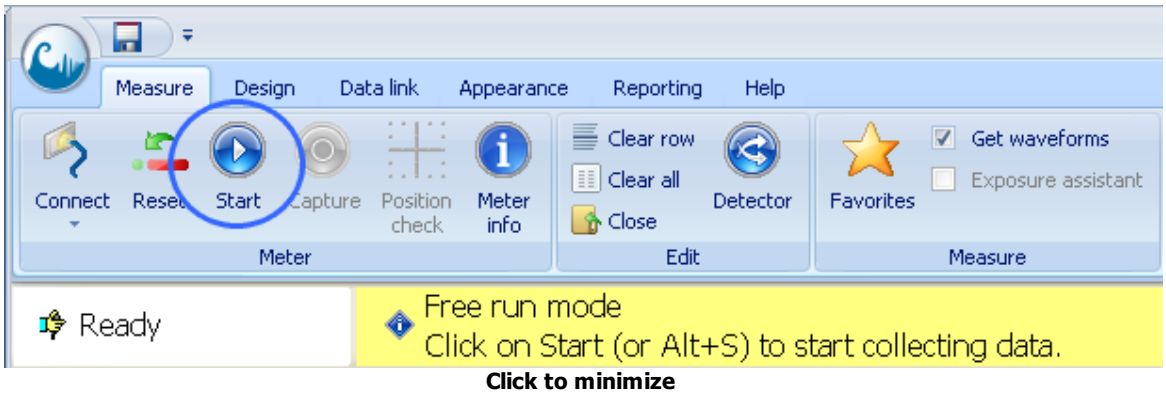
When you click the Capture button the data in the grid and the displays freeze and a waveform is acquired. Once you captured the data, you can either turn off the exposure or you can resume measuring by clicking the Start button (located to the left of the Capture button). If you turn off the exposure, the meter recognizes this and moves on to the next row.

3.1.18.2 Free run

The free run mode has no trigger level, so it is ideally suited for measuring very low signals. In this mode, the meter will start measuring even if there is no signal. Use the Start button to begin the measurement. As soon as you pressed the Start button, Ocean will start to display measured data and you can use the Capture button to save it at any time. Free run gives you access to an additional sensitivity range called "Very high sensitivity" (see Meter Adjust for more information). A "Moving average" function is also available to further stabilize the readings. Note: No waveform is available when you use Free run mode.

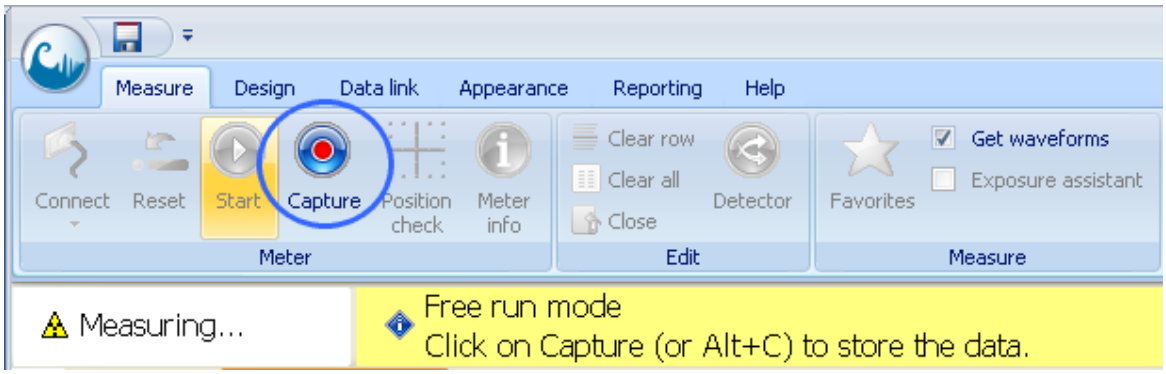
When Free run mode is used, you must start the measurement manually by clicking the Start button. To use Free run mode:

1. When Free run is active the following is shown on the ribbon bar when you are on a new row:



Click to minimize

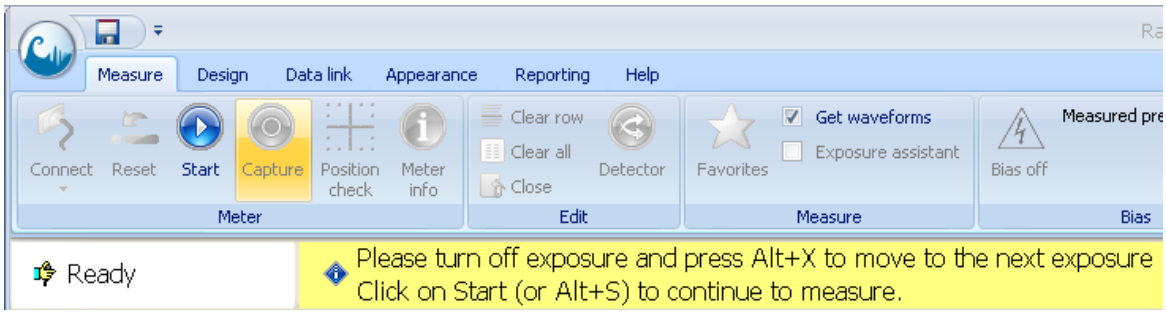
2. Click Start when you are ready to begin measuring.



Click to minimize

3. Click Capture when the measured values are stable and you want to capture the data.

4. When you click the Capture button the data in the grid and the displays freeze. If you want to keep it, turn off exposure.



Click to minimize

You can also click Start to resume measuring.

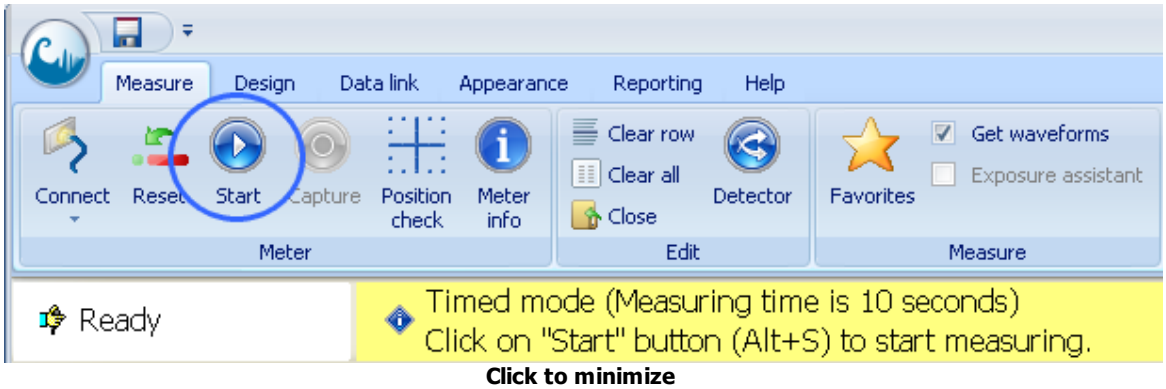
5. Click on the yellow field after you have turned off the exposure to move on to the next row in the grid.

3.1.18.3 Timed

The Timed mode setting measures during a pre-defined time period. Measurements in Timed mode must be started manually. This measuring mode is very useful when you want to measure a very low signal. You can use the "very high" sensitivity setting in Timed mode for the external detector and it will further improve the meter's capability to measure very low signals. The measuring time is defined on the Meter tab (see Meter Adjust for more information).

When Timed mode is used, you must start the measurement manually by clicking the Start button. To use Timed mode:

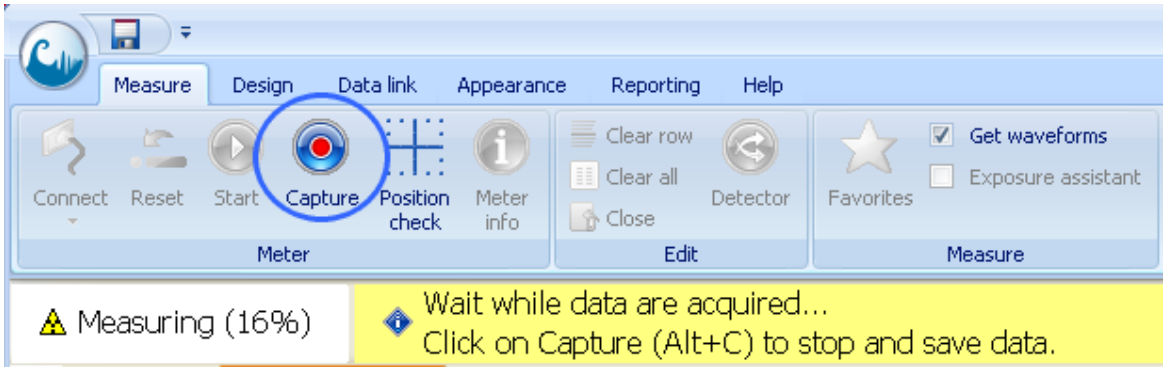
1. You may start the exposure at any time (before or after you click the Start button), depending on the situation:



Click to minimize

When you click the Start button, the measurement starts.

2. The capture button now becomes active.



Click to minimize

The meter will continue to measure according to the specified time setting. The progress is shown on the status bar. You can stop before the time expires by clicking the Capture button.

3. When the measurement is completed (after expired time or if you clicked Capture) you are asked to turn off the exposure before Ocean proceeds to the next row in the grid.

3.1.19 Light measurements

When you make light measurements using the Piranha light probe or the L100 light probe for Barracuda, there are a few important things to be aware of. To make light measurements with Piranha or Barracuda is slightly different than making measurements with other (dedicated) light meters.

Piranha and Barracuda both have a reset function that is not present in other light meters. This means that the detector must be protected from light every time the meter does an automatic reset or when you reset the meter by clicking the Reset button. Another thing to consider is the use of high and low sensitivity. You may see a "---" instead of a measured value. This indicates a measuring error, normally "high signal" or "low signal". You must change the sensitivity settings if this happens.

Luminance (cd/m2)

Normally this is not a problem when you measure luminance, as the adapter (Monitor-adapter) you put on the light probe has a shutter. This shutter is only open when you press the button. When the shutter is closed no light reaches the light detector and the meter can reset and find the zero level. Just make sure to keep the shutter closed when:

- you start a test (activate) or real-time display with the meter connected.
- you switch from keyboard mode to connect mode and you want to measure luminance.
- the meter is adjusting. This occurs when you move from one measurement to another (from one row to another row) if the settings for the meter are different in the next row. If meter settings are exactly the same, not adjustment of the meter is done and you don't need to release the shutter when going from one row to another.

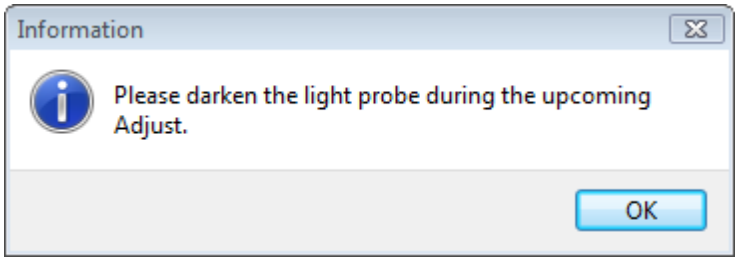
In all these situations the shutter should be closed.

Illuminance (lux, lx)

When you measure illuminance you have to be aware that the adapter (Lux-adapter) doesn't have a shutter. It is sensing the light all the time. You must manually darken it every time the meter is resetting. To make it easier for you, Ocean will remind you about this in the following situations:

- When you start a test (activate) or real-time display with the meter connected.
- When you switch from keyboard mode to connect mode and you want to measures luminance.

The following message is displayed to remind you to darken the detector.



When you see the above message, darken the light probe and make sure that it doesn't "see" any light, then click OK. Keep the detector darkened until the meter finished adjusting itself and is ready to measure.

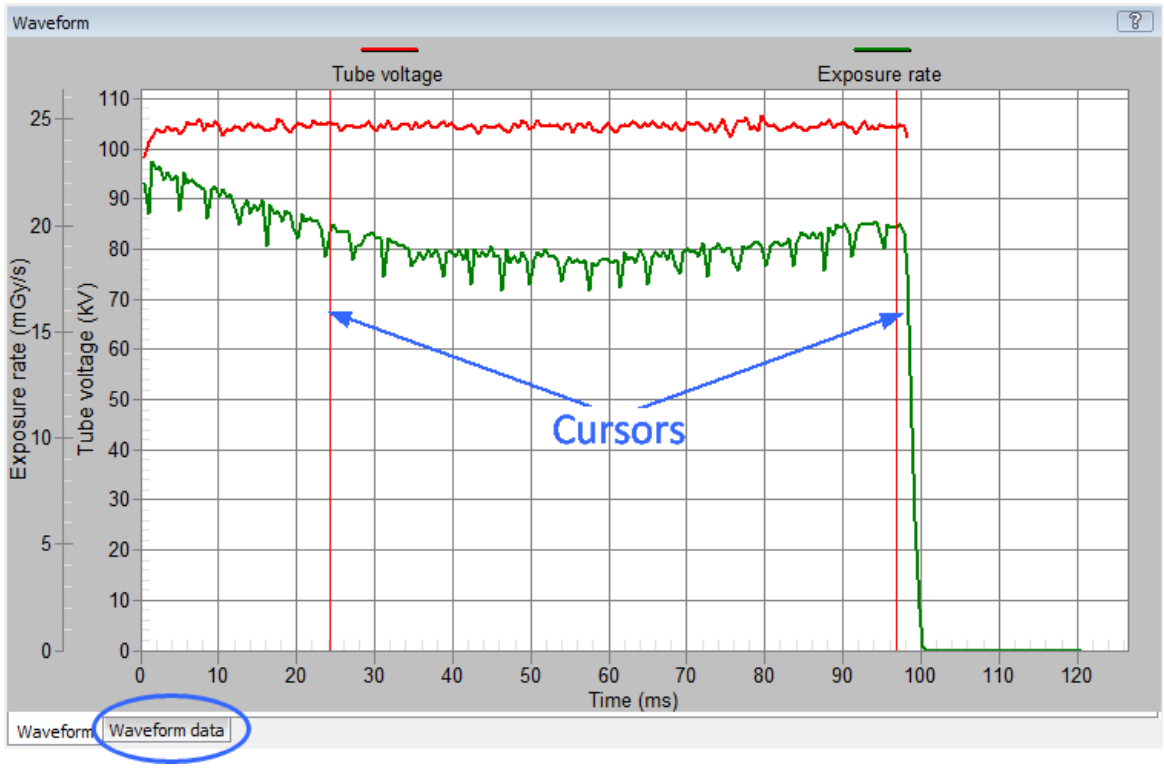
When you move from one measurement to another (from one row to another) no message is shown, but you must make sure that the detector is darkened when a meter adjust is done. If you are not sure if a meter adjust will be done when you move to the next row, darken the detector before you go to the next measurement.

Recommended measuring mode for light measurements

You can use any of the three measuring modes (normal, free run and times) when you measure light. All of them have advantages and disadvantages. We recommend that you build your templates with normal mode with exposure assistant when you measure luminance and free run mode when you measure illuminance.

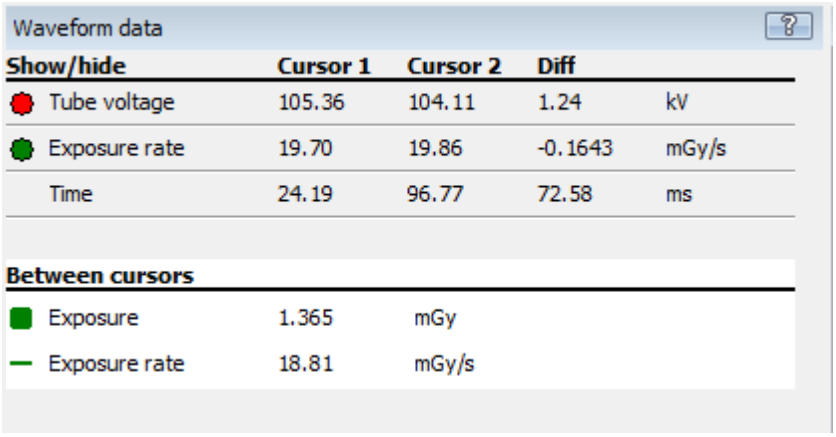
3.1.20 Waveforms

Waveforms are acquired after each exposure. The waveforms are shown in the Waveform tab normally located in the lower left corner of the screen.



Click to compress

There are two cursors you can move. The cursor data is shown on the Waveform data tab.



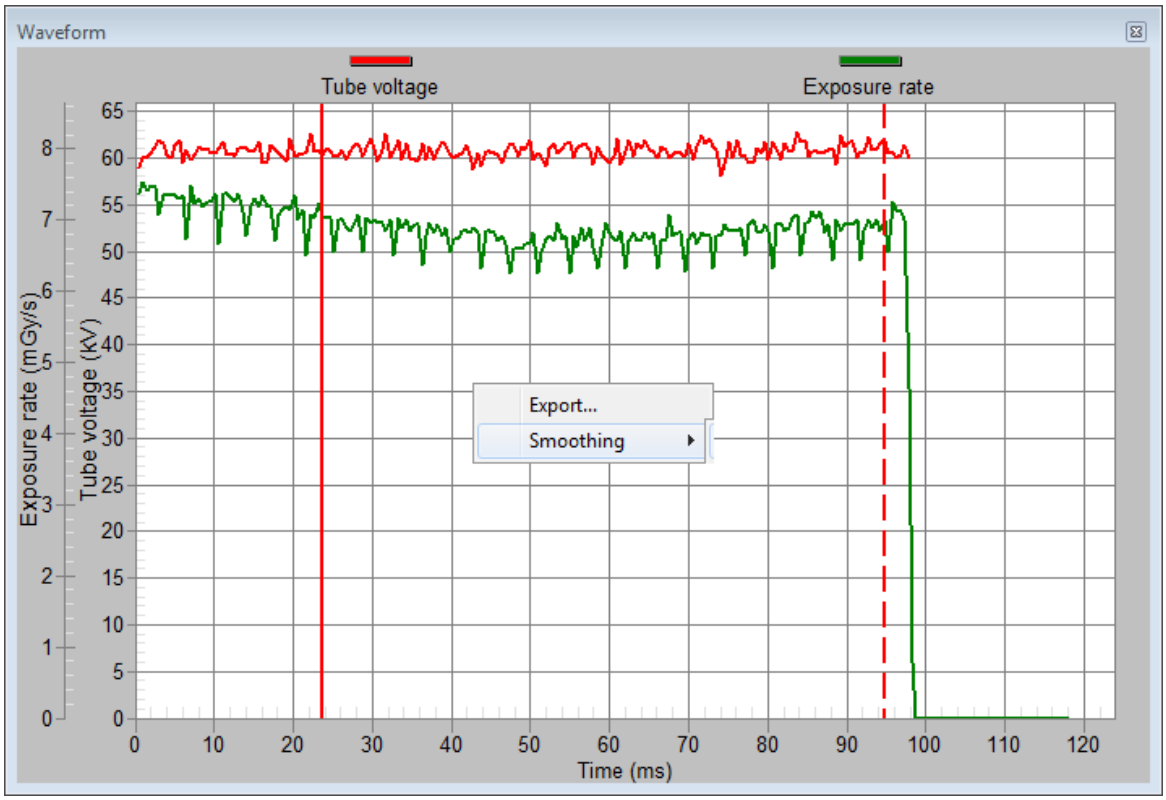
Click to compress

There is a cursor #1 and a cursor #2 for each waveform value. For waveforms where the integrated value between the cursors are relevant, the integrated value and average (between cursors) are in the section "Between cursors".

There are two functions available if you right-click on the waveform graph, Export and Smoothing.

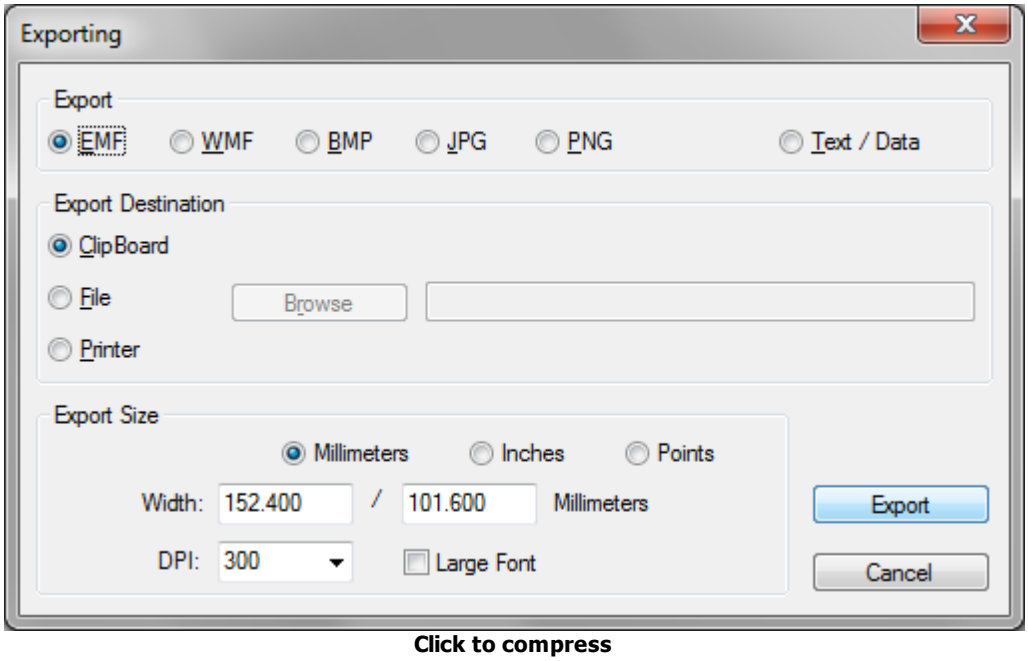
Export

You can export the waveform as values or as an image by right-clicking on the graph:



Click to compress

Select Export from the right-click menu. A dialogue is shown that allows you to export the waveform in different ways:



Click to compress

You can select:

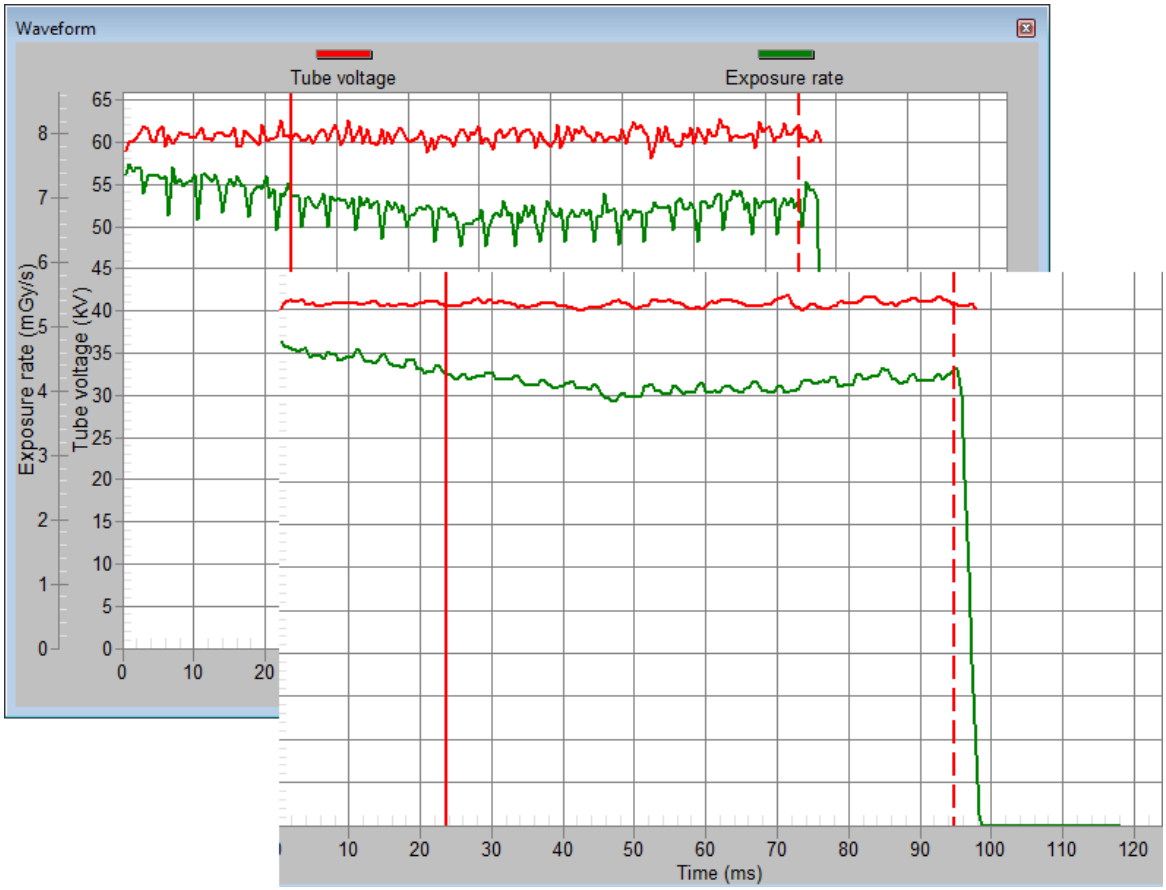
- Image
- Text/Data

You can select destination:

- ClipBoard - use this to quickly cut-and-paste an image into any document.
- File - especially useful if you export Text/Data, you can in this way export the data points and put them into a spreadsheet.

Smoothing

If you have a noisy waveform you can apply smoothing to make it look better. Right-click on the waveform graph and select smoothing. You can select 2 to 5 samples or "No smoothing".

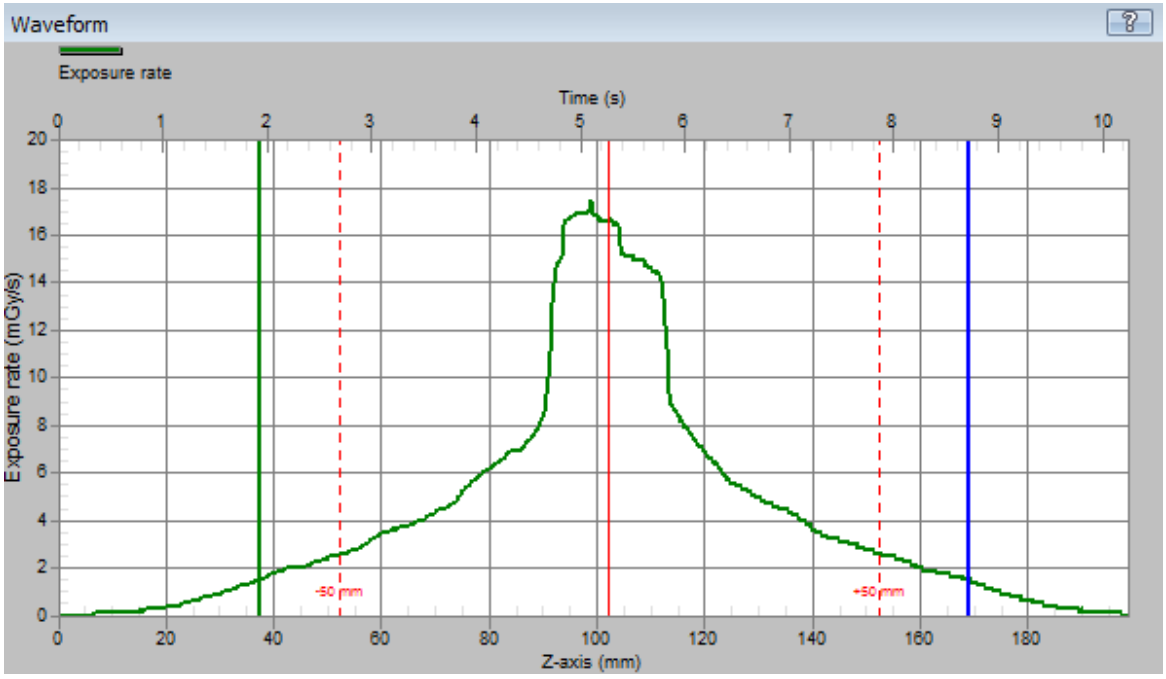


Click to compress

CT Dose Profiler Analysis

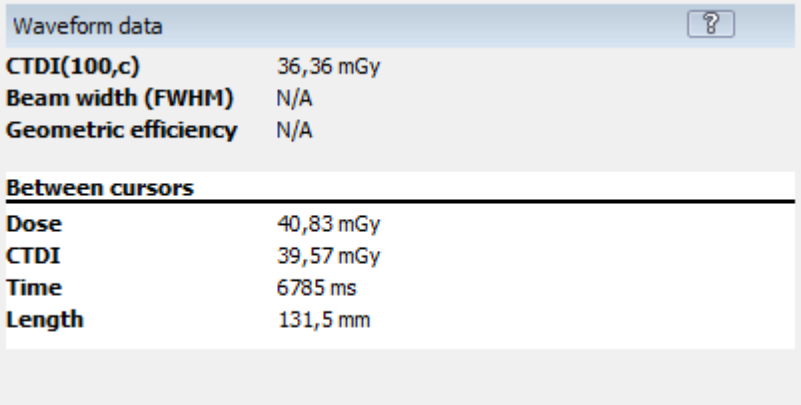
When the CT Dose Profiler is used and an CT Dose Profiler Analysis (CTDI(helical scan(in phantom) or CTDI(helical scan/free-in-air) is present an alternative waveform graph and the waveform data panel is shown:

Waveform graph for CT Dose Profiler analysis



Click to compress

Waveform data panel for CT Dose Profiler analysis

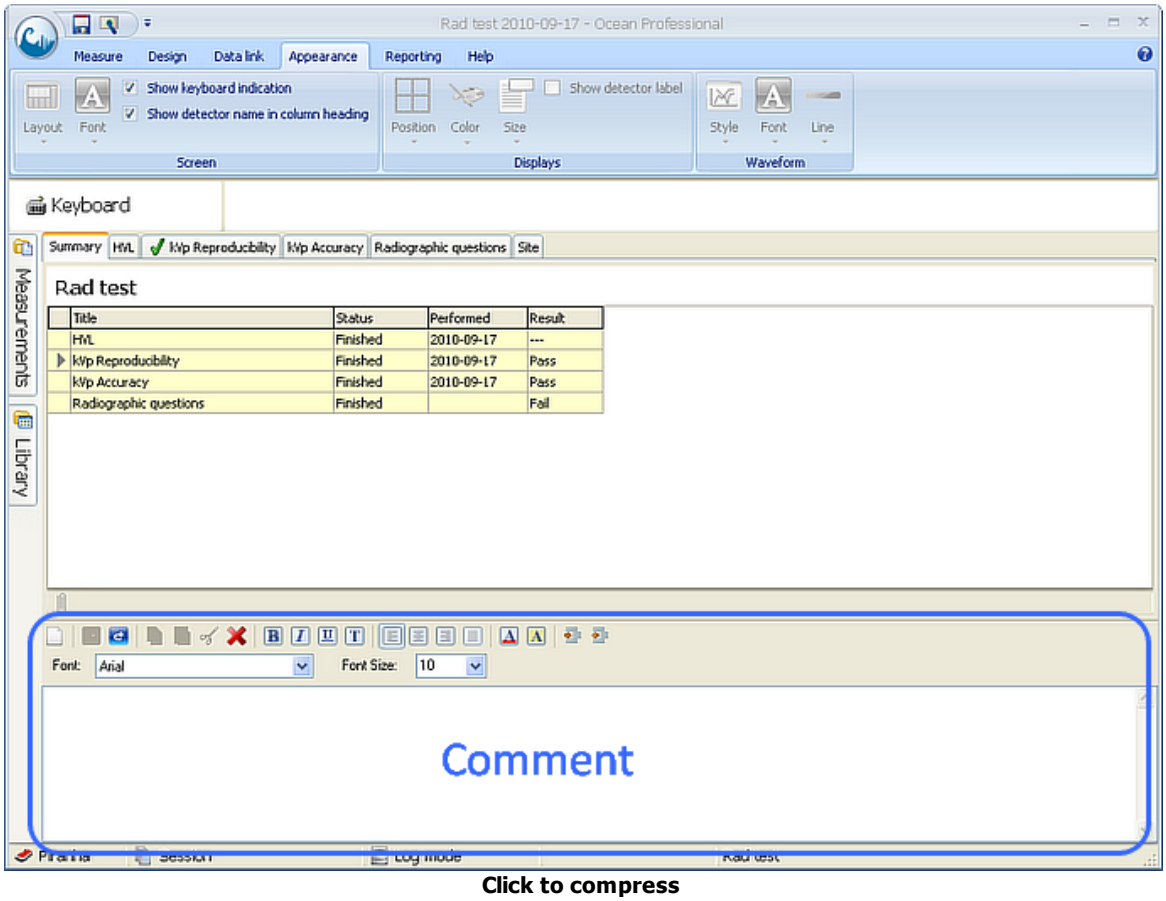


Click to compress

3.1.21 Comments

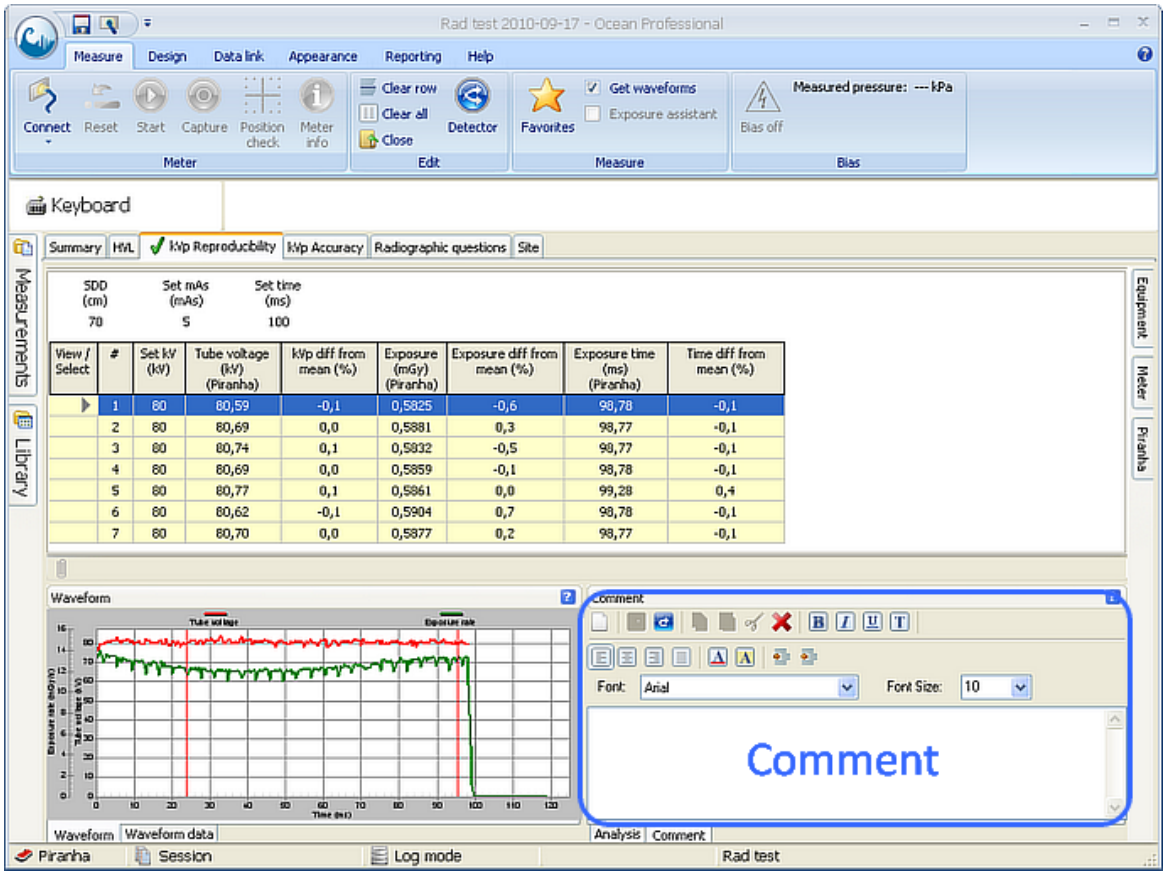
There is a comment tab available in sessions, tests, checklists and real-time displays. The text you type here is a "measured value". This means that it is not stored in the template and it is erased when you click on "Clear all".

Session comment



Click to compress

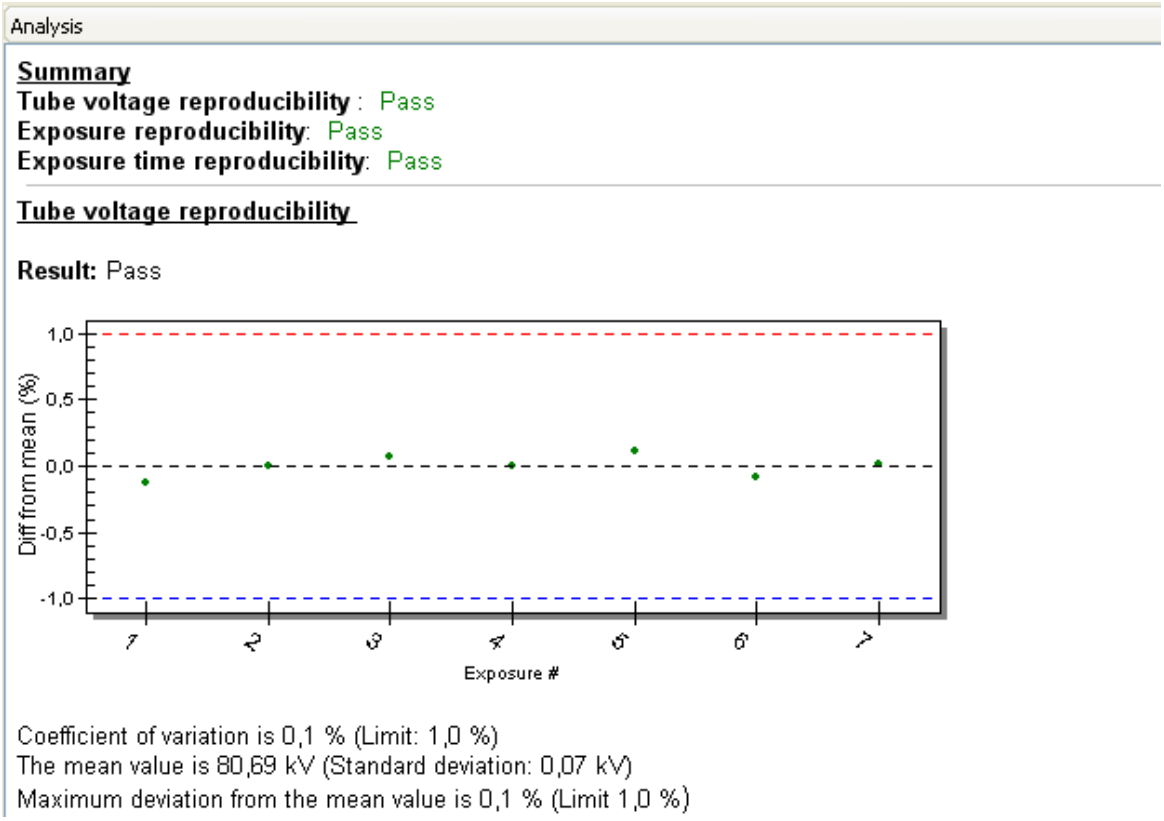
Test/Checklist/Real-time display comment



Click to compress

3.1.22 Analysis

The analysis is normally displayed in the lower right corner of the screen.



The analysis results of a test (or real-time display if you are running Professional) is displayed on the analysis tab.

You can read in the Add analysis topic how to add analysis to your test or real-time display.

3.1.23 Messages

There are three different types of messages you may encounter using Ocean:

- Measuring errors - this is shown when the meter is not able to measure what Ocean is asking for
- User or system errors - this is internal problems in Ocean or in the meter you are using
- Crash - an unknown problem occurred

Messages are shown in different places depending on what you are doing. A measuring error is indicated in two places:

- A general error message without any specific information shown in the upper status bar.
- A measuring error is indicated with "---" in the grid. You can move the cursor above the "---" and a text message will explain what type of problem that occurred.

System errors and crash messages are shown in separate dialogues.

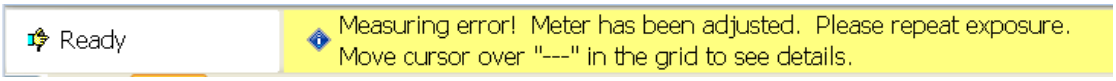
Measuring errors

Measuring errors occur when the meter can't measure what Ocean is asking for. Normally the problem is too high or too low signal, too high or too low kVp and so on. Ocean will change the meter settings in most cases and ask you to repeat the exposure. Usually, after such adjustment

you are able to get measured data and proceed to the next measurement. This is called "Active messages" and is normally activated in Normal and Timed modes. "Active messages" are not available in Free run mode. When you are in Free run mode, you must adjust the meter manually when you encounter a measuring error. Ocean will tell you that you have to change meter settings manually or change other conditions (change distance, change mA, change time or some other parameter) to get a good measurement.

With active messages

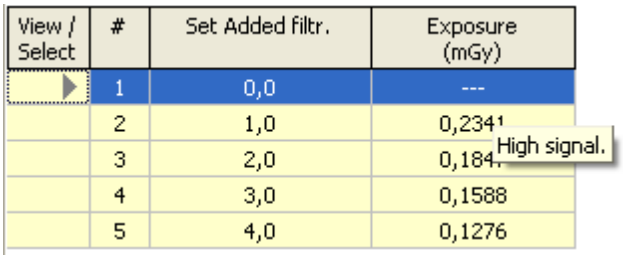
When a measuring problem occurs, and Active messages is ON, the upper status bar shows a message (see picture below).



Click to compress

The above message informs you that a measuring error has occurred and that Ocean adjusted the meter. You are also prompted to repeat the exposure. You will be able to get a measurement value in most cases, after the meter has been adjusted. The meter may be adjusted several times in some cases and you have to repeat the exposure several times before getting a measurement value.

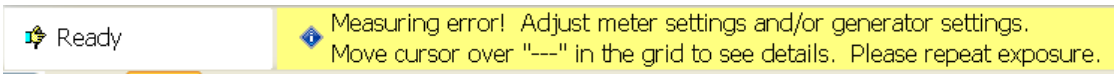
The parameter that failed will be indicated with a "---" in the grid. If you move the mouse pointer over the "---" a text message will specify the type of problem that occurred.



In this case the problem was too high signal. Ocean has now changed the sensitivity of the detector being used and the next exposure will be correct.

Without active messages

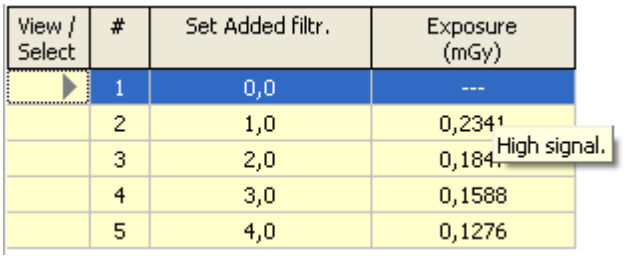
If you have turned off active messages (see Program Options) you must adjust the meter manually when you encounter a measuring error. The upper status bar will show the message:


Ready
Measuring error! Adjust meter settings and/or generator settings.
Move cursor over "---" in the grid to see details. Please repeat exposure.

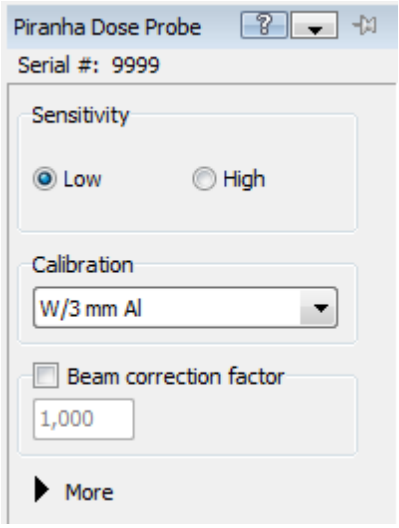
Click to compress

The above message informs you that a measuring error has occurred and that you must adjust the meter settings. You are also prompted to repeat the exposure. You will be able to get a measurement value in most cases, after the meter has been adjusted. The meter may be adjusted several times in some cases and you have to repeat the exposure several times before getting a measurement value.

The parameter that failed will be indicated with a "---" in the grid. If you move the mouse pointer over the "---" a text message will specify the type of problem that occurred.



Adjust corresponding detector by opening its Meter tab (in this case was the Piranha Dose Probe used):



Change the Sensitivity from "High" to "Low" and repeat the exposure.

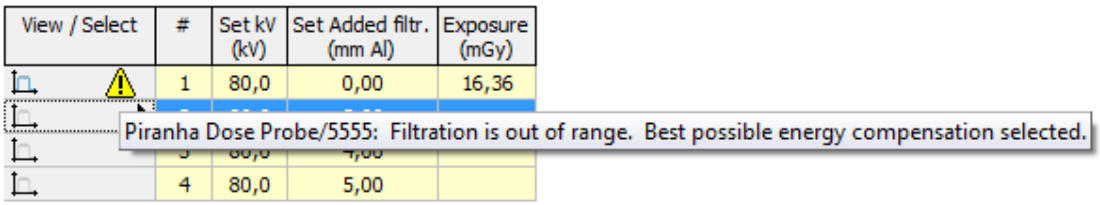
-End-

Warnings for uncompensated values

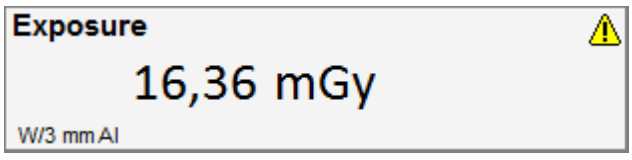
Normally measured values are automatically compensated:

- Measured kVp is compensated for the amount of filtration in the beam
- Measured dose values are compensated based on kVp and total filtration

If a value can't be compensated a warning is shown for the corresponding row:



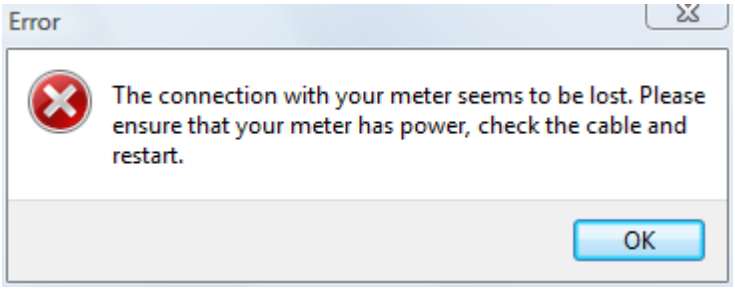
If you are using a real-time display, the warning is also shown in the display:



-End-

User or system errors

A dialogue box, such as you see below, is displayed when a system error occurs. It explains what the problem is.

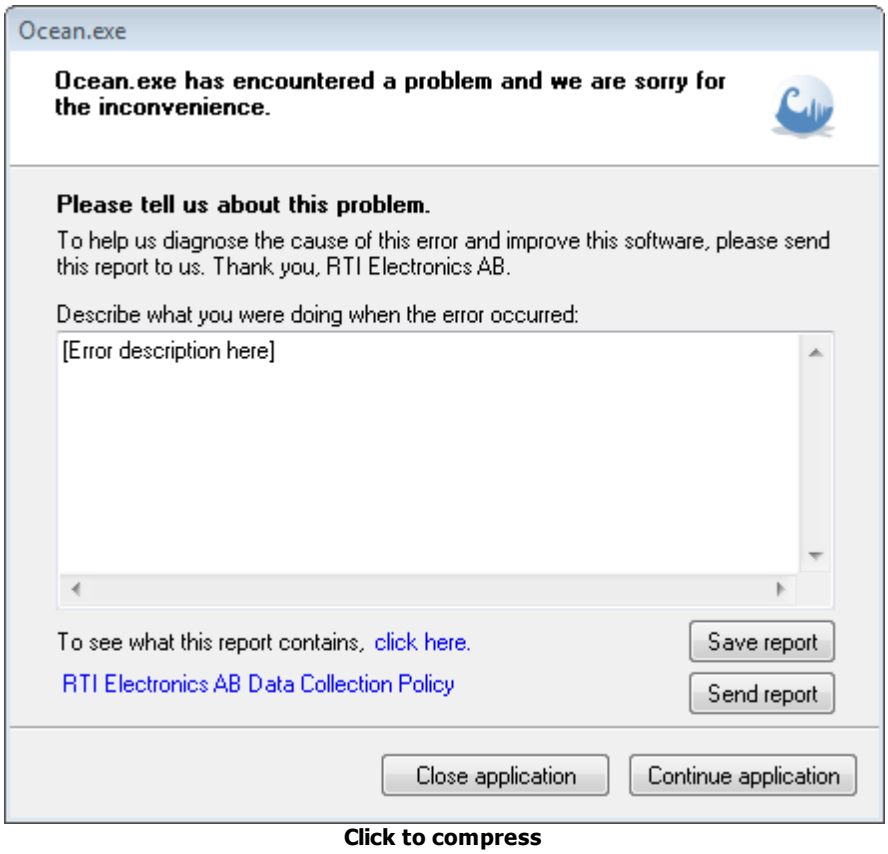

Error
The connection with your meter seems to be lost. Please ensure that your meter has power, check the cable and restart.
OK

You can just click OK and continue measuring in many cases, and the problem will probably not recur. If you see the same message on a regular basis or if it stops you from doing your job you should contact RTI Support for assistance.

-End-

Crash report

Ocean may generate an exception error if an unknown problem occurs. A dialogue like the one you see below is shown:

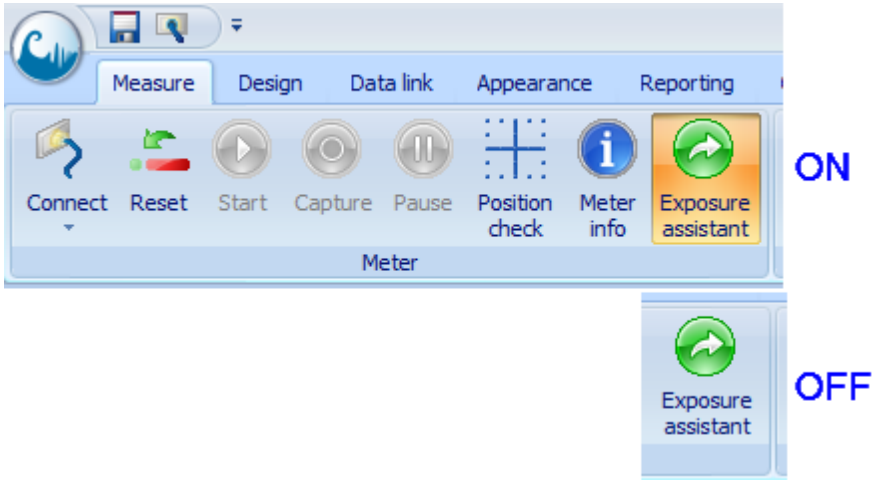

Ocean.exe
Ocean.exe has encountered a problem and we are sorry for the inconvenience.
Please tell us about this problem.
To help us diagnose the cause of this error and improve this software, please send this report to us. Thank you, RTI Electronics AB.
Describe what you were doing when the error occurred:
[Error description here]
To see what this report contains, click here.
RTI Electronics AB Data Collection Policy
Save report
Send report
Close application
Continue application

Click to compress

This dialogue will collect all important information that RTI needs to find the problem and correct it. You will be asked to describe what you did just prior to the crash. This is very important information so try to give a step-by-step account of exactly what you did when the error appeared. You can choose to send the report immediately by choosing the "Send report" option or create a file on your desktop and send it to RTI later. Send any error reports to ocean@rti.se.

3.1.24 Exposure assistant

The exposure assistant helps you to do fluoro and light measurements. The exposure assistant "looks" it the measured values and captures the data when they are stable. When data are acquired Ocean asks you to stop the exposure. It is very convenient to use it since you don't need to click on any buttons to capture the measured values. You can enable and disable the exposure assistant from the ribbon bar:



The exposure assistant "looks" at the following measured values:

- kVp
- Exposure rate
- mA
- Pulse rate
- Light (cd/m^2 or lux)

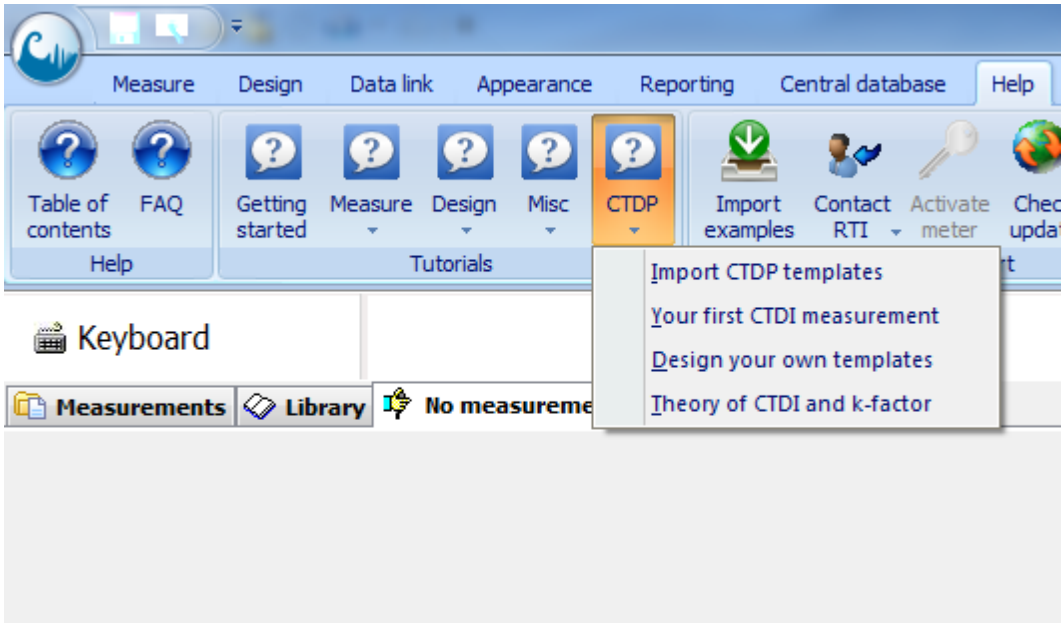
Measured values are considered to be stable when there consecutive values differ less than:

kVp	3%
Exposure rate	3%
mA	5%
Pulse rate	0.3 pulses
Light	5%

3.1.25 The CT Dose Profiler Probe

The CT Dose Profiler is fully supported in Ocean and the "old" software CT Dose Profiler Analyzer is phased out October 2012 and will not be developed any further. There is a separate new manual CT Dose Profiler User's Manual that describes how to use the CT Dose Profiler probe with Ocean. The manual comes with all new CTDP probes and can also be found on the Product CD or downloaded from http://www.rti.se/downloads/manuals/.

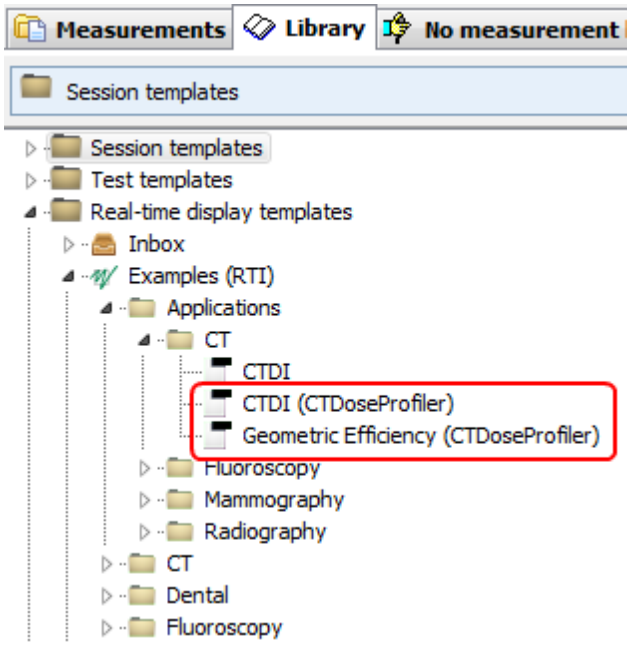
You will also find the most importnat part of the manual as a tutorial directly accessible in Ocean:



Click to compress

Go to the Help page of the ribbon bar and select CTDP.

If you are upgrading make sure to load the new example templates that are available for the CT Dose Profiler. Follow the description in the topic Import examples and select Barracuda or Piranha and CT + CT Dose. The templates will be found in the folder:



Click to compress

These two templates are working with all license levels of Ocean and they are locked and only set values can be changed if you have Display or Connect. If you have Professional you can modify the templates in any way you want. These two templates cover measurements of CTDI in head/body phantom, CTDI free-in-air and Geometric Efficiency.

If you have Professional you can also design your own templates for the CT Dose Profiler.

3.2 Design

Most of the functions you will need when you make templates are located on the Design tab of the Ribbon bar. There are six groups of functions you will need to know about: New, Session, Test/ checklist, Real-time display, Miscellaneous and Analysis. See below a more detailed discussion on all of these groups of functions.

New



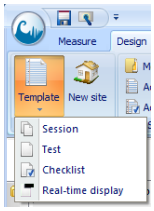
These two functions you use when you want to create something new (a template or a site).

Template - Design a new template

A template is an object without any measured data. It is like a pre-defined test protocol without any actual measurements in it. A template has all the necessary information to perform a certain task (either a measurement, a group of measurements or a checklist). The template contains any or all of the following:

- set values
- meter settings
- analysis (with it's own pre-defined pass/fail criteria)
- pre-defined pass/fail answers to quality assurance compliance questions (checklists)

Using a template to perform a certain task, therefore, is a fast and efficient way of doing quality assurance compliance testing for X-ray systems. You can create four different types of templates that will be stored in the database for future use. They can be used individually (session and real-time display) to quickly repeat standard measurements. Test and checklist templates are used as "building blocks" for creating session templates containing a complete set of measurements and checklists to complete specific quality assurance compliance testing required by regulatory agencies responsible for X-ray system quality control. Once these templates are created, you can share them with your colleagues and regulatory agencies if you like.



When you click on the **Template button** you can select the type of template you want to create. The four template choices are listed below:

- New Session template
- New Test template
- New Checklist template
- New Real-time display template

New Session template

When you click on the Session template choice, it starts a wizard to help you create your new session template. A session template is a collection of tests and/or checklists that together define a complete job. When you make measurements with a session template, a report can be generated upon completion of all the measurements. The wizard lets you:

- Select test and checklist templates from the Library
- Specify a title and other information for the session template
- Specify options that control the report generation process

When the wizard is done the session template is created and opened. It is possible to add and remove tests and checklists "on the fly" after the session template has already been created and saved.

Click on Save to save the session template. You can find your new session template under the Library tab to the Left of the Main screen grid under Session templates. Read more about session templates in the topic Design a session template.

New Test template

When you click on the Test template choice, it starts a wizard to help you create your new test template. A test template is a table with a number of exposures. The measuring conditions, meter settings and required calculations are specified for each exposure. You can assign different types of analysis calculations to one or several of the exposures in the template. When you use the template, you will be able to see the analysis results on the right side of the screen below the grid. The analysis calculations will be made on the row or several rows you specify and will be saved with the measured data. The wizard will take you through a number of steps to create the basics of a test template.

When you start the Test template wizard it will help you do the following:

- Specify a name and other information for your new test template
- Select a modality
- Select the number of columns, detectors and calibrations you wish to use
- Select other general settings for your new template

Just follow the wizard's guidance and making a template will be easy. When the wizard is done the test template is created and opened. To complete your new test template you also have to do the following:

- Specify set values (generator, conditions and so on)
- Adjust the meter settings for each row if necessary
- Add one ore more analysis with pass and fail criteria
- Modify appearance: you can change the order of columns, modify the number of decimal places for the numeric values, choose the measurement units to be used and you can change the size and location of the different windows on your screen

Click on Save to save the test template. You can find your new test template under the Library tab to the Left of the Main screen grid under Test templates.

You can go ahead and use your new template now if you have your instrument connected to Ocean and your instrument has the capability to make the measurements required by your template. This way you can try your new template and adjust the settings if necessary to make sure the template is exactly what you wanted.

NOTE: A test template cannot be stored with measured data. Read more about this in the topic Design a test template.

New Checklist template

When you click on the Checklist template choice, it starts a wizard to help you create a new checklist. A checklist is a number of questions and/or tasks that need to be performed and confirmed. For each row you can specify the following:

- A question or task text
- The type of answer (choose from yes/no, text, value or user-defined options)
- Additional information (extensive text and picture information related to the question or task you are working on)
- Add pass/fail criteria
- Recommendation in case of failure
- Name for the checklist and other additional information

Click on Save to save the checklist template. You can find your new checklist template under the Library tab to the Left of the Main screen grid under Checklist templates.

NOTE: A checklist template has no answers in it and it cannot be saved with results. Read more about this in the topic Design a checklist template.

New Real-time display template

When you click on the Real-time meter template choice, it starts a wizard to help you create your new real-time display. A real-time display is a template with a number of displays and a grid where measurements are logged. The wizard will take you through the following steps to create the real-time display template:

- Select a modality the template will be used with
- Select the number of columns, detectors and calibrations you wish to have
- Select other general settings

Just follow the wizard's guidance and making a real-time display will be easy. When the wizard is done the real-time display template is created and opened. To complete your new real-time display you also have to do the following:

- Specify set values (generator, conditions and so on)
- Adjust the meter settings for each row as necessary
- Modify appearance: you can change the order of columns, modify the number of decimal places for the numeric values, choose the measurement units to be used and you can change the size and location of the different windows on your screen

Click on Save to save the real-time display template. You can find your new real-time display under the Library tab to the Left of the Main screen grid under Real-time display templates.

You can go ahead and use your new template now if you have your instrument connected to Ocean and your instrument has the capability to make the measurements required by your template. This way you can try your new template and adjust the settings if necessary to make sure the template is exactly what you wanted.

You may also choose to save your real-time display with the measured data. In this instance, the real-time display with the measurements will be saved under the Measurements tab to the left of the Main screen grid. Read more on this in the topic Design a real-time display template.

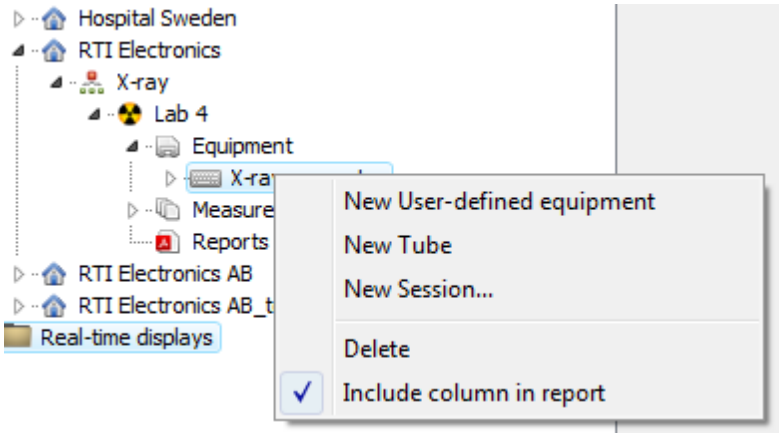
-End-

Site - Create a new site (facility/department/room/generator/tube)

When you click on the Site button, it starts a wizard that will help you create a new site. A site is a description of a location and equipment to be tested. The wizard will take you through a number of steps to do the following:

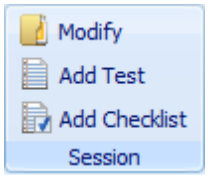
- Create a facility, department and room
- Create a generator and tube

When the wizard is done, a new site is created. To find your new site, look under the Measurements tab to the left of the Main screen grid. The equipment belonging to the new site you just created is found under the Equipment tab to the right of the Main screen grid. You can add more equipment to a room and more rooms to a site at any time by right-clicking on the room name or site name in the tree to which you wish to add new items (see picture below).



Read more in the topic New site.

Session



These are the functions to use when you wish to edit a Session template.

Modify - Modify current session

If you click the Modify button the session template building wizard starts. This wizard will let you modify the following:

- Session template information
- Add/remove test and checklist template
- Change settings for the report

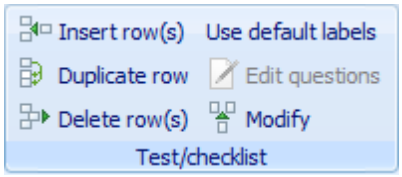
Add Test - Add a new test to current session template

If you click on this button you can add an existing test template to the session template you are working with or build a completely new one and add it "on-the-fly". Read more in the topic Add/ Delete a test to a session.

Add Checklist - Add a new checklist to current session template

When you click this button you can add an existing checklist template to the session template you are working with or build a completely new checklist and add it "on-the-fly". Read more in the topic Add/Delete checklist to a session.

Test/Checklist



These functions are used to edit an existing test or checklist template.

Insert row(s) - Add more rows to current test or checklist

With this function you can do the following:

- Number of rows to insert
- Insert first, last or before/after active row

Inserted rows will not be assigned to any analysis.

Duplicate row - Duplicates selected row

Selected row is duplicated, the new row(s) will be a copy of the selected row, including any analysis.

Delete row(s) - Delete selected rows

Delete the selected row(s). By default, this function deletes the current active row. You do have the option to select a range of rows for deletion by using multi-selection.

Use default labels - Force user-defined labels into the template

When you click this button is active template updated with default labels as they are specified in Program Options.

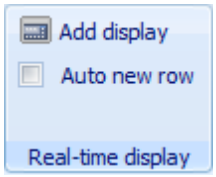
Edit questions - Edit questions in a checklist

Click this button if you want to edit a question is a checklist.

Modify - Modify current test or checklist

When you click this button, the checklist design mode is enabled. You can go back to working mode again by clicking the Modify button again or by clicking the Close button.

Real-time display



These functions are used when you want to edit a real-time display template.

Add display - Modify current real-time display

Use this button if you want to add or delete displays in your real-time display template.

Auto new row - Select if you want to add new rows automatically

If you have Display license level, this checkbox is always checked.

If you have Connect or Professional license level, you have the ability to create real-time display templates with a specific number of rows pre-defined. When you use a real-time display template, just make your measurements and when you wish to stop, uncheck this box and no further rows will be created.

Micelleneous



These functions are used when editing a Session or Test template.

Detector - Select or change the detectors to be used

When you click the Detector button, the detector selection dialogue will be shown and you may select any detector you have in the list to be used with your template. Read more about this in the topic Detector selection.

Protection - Add protection to templates

A session or real-time template template can be protected from modification. Read more on this in topic Protection.

Check ID-s - Check for duplicated IDs

A session or real-time template template can be protected from modification. Read more on this in topic Locate data during import and export.

Analysis



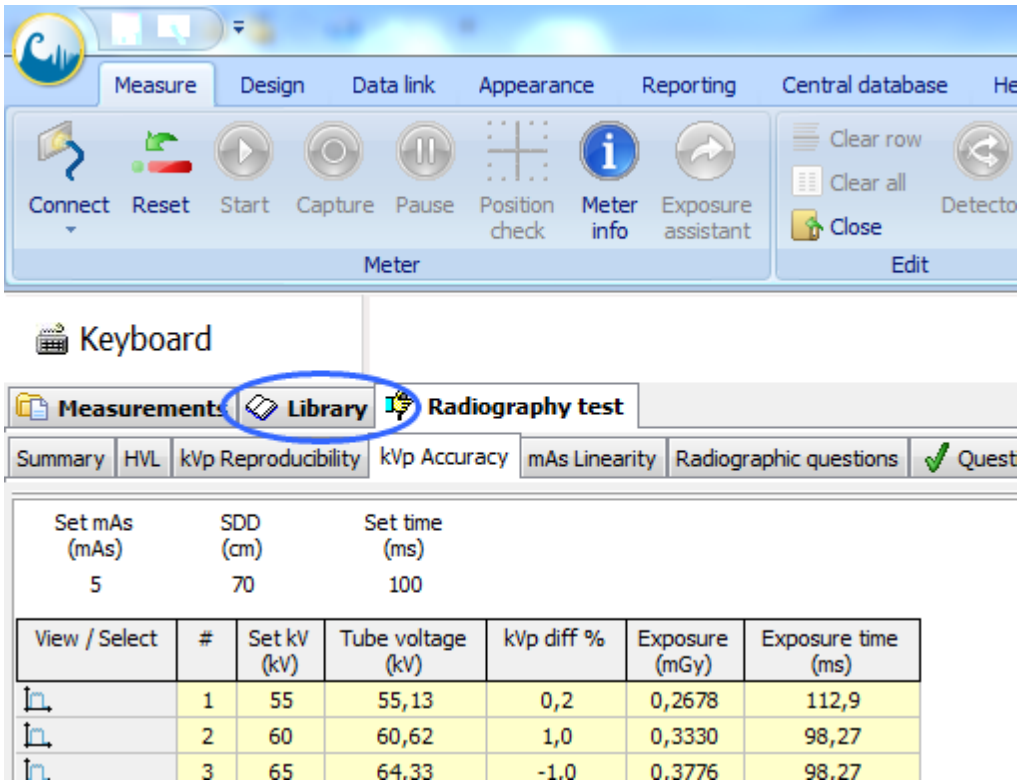
This function is to add or change analyses in the current test template.

Setup - Add/modify analysis in the current test template

Use this button if you wish to add an analysis to your test template, or if you want to change the current analysis to something else. Read more about this in the topic Analysis (Definitions).

3.2.1 Library

All your empty "protocols" (templates) are stored in the Library part of the database. You can easily access your templates via the Library tab (see picture below):



Click to compress

You can view the Library by clicking on the tab. You can design your own templates from the beginning or pick an existing one and rework that one according to your needs.

There are four different types of templates:

- Session (available only in Professional license)
- Test (available only in Professional license)
- Checklist (available only in Professional license)
- Real-time display

Preveiw

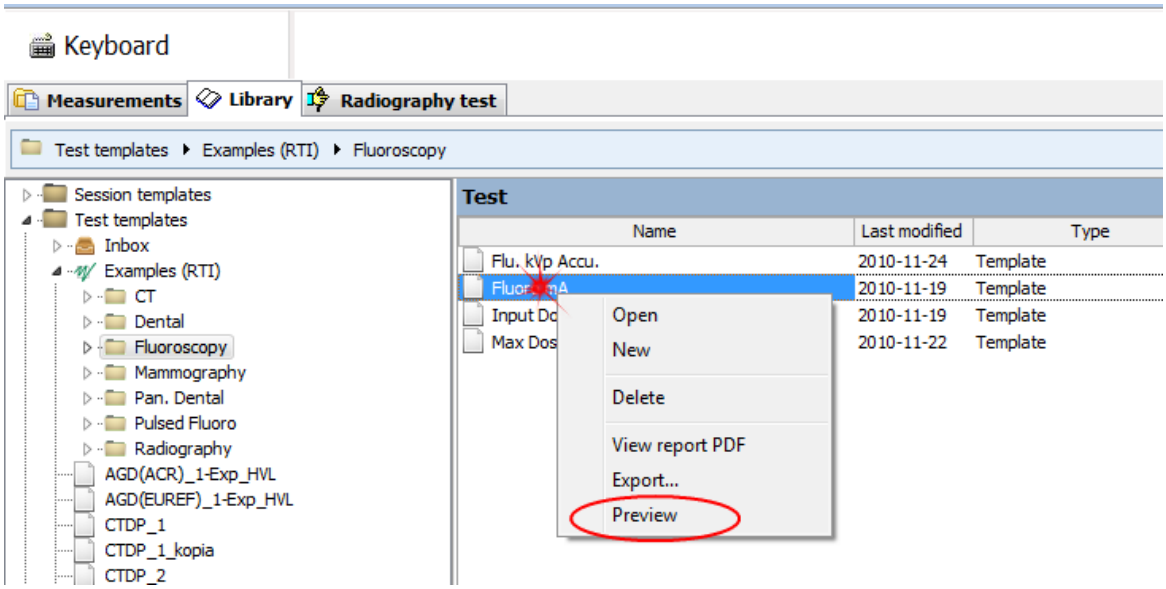
It may be convenient to use the preview function when looking for a specific template in the tree. You can preview in two different ways:

- click on a template in the tree, the preview is then shown to the right
- right-click on a template in the list view, the preview is then shown in a separate window

Preview from the list view:

1. Right-click on a measurment.

2. Select Preview from the menu:

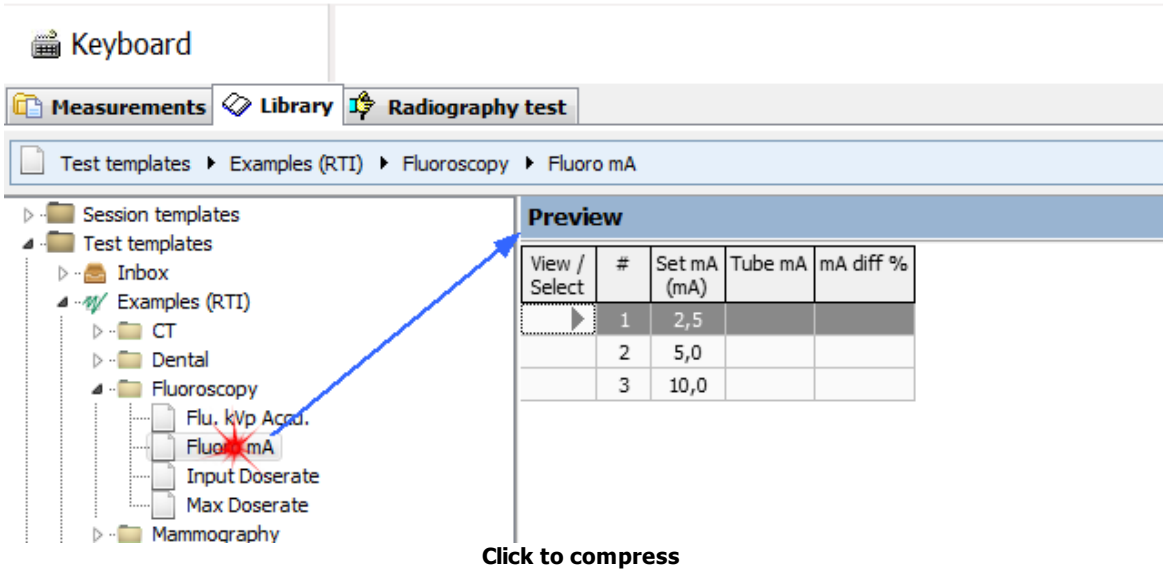


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Preview from the tree:

1. Click on a template in the tree.

2. The preview is shown to the right:



Click to compress

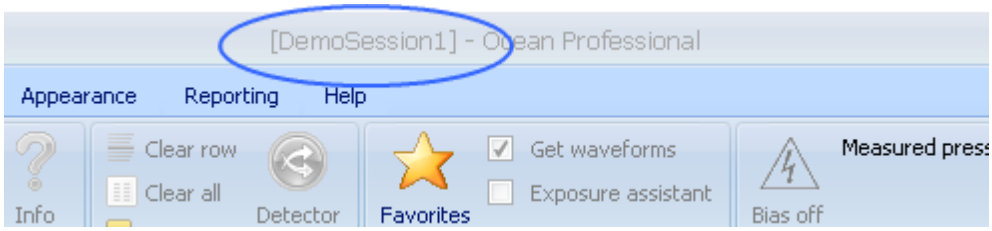
3.2.2 Templates

A template is an object that describes what you do when you use Ocean. It can be a template for a complete QA job with tests and checklists. It has information about the measuring conditions of each test, meter settings and space to store the results. It can also be a template for a single test/checklist or a template for a quick measurement using a real-time display.

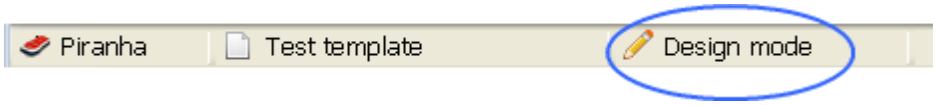
There are four types of templates:

- Test templates
- Checklist templates
- Session templates
- Real-time display templates

When you are in template design mode, the template name is shown within square brackets on Ocean's main title bar.



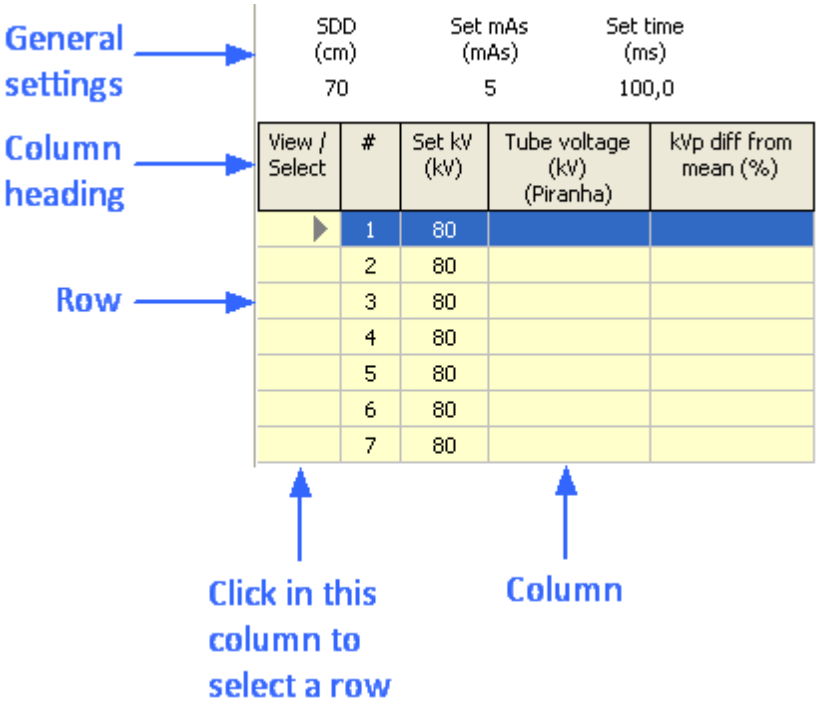
When you work with a template,"Design mode" is indicated on the status bar at the bottom of the screen.



IMPORTANT: When you save a template **no measure data is saved**.

Test templates

A test template describes one test. The test templates are completely user-defined.



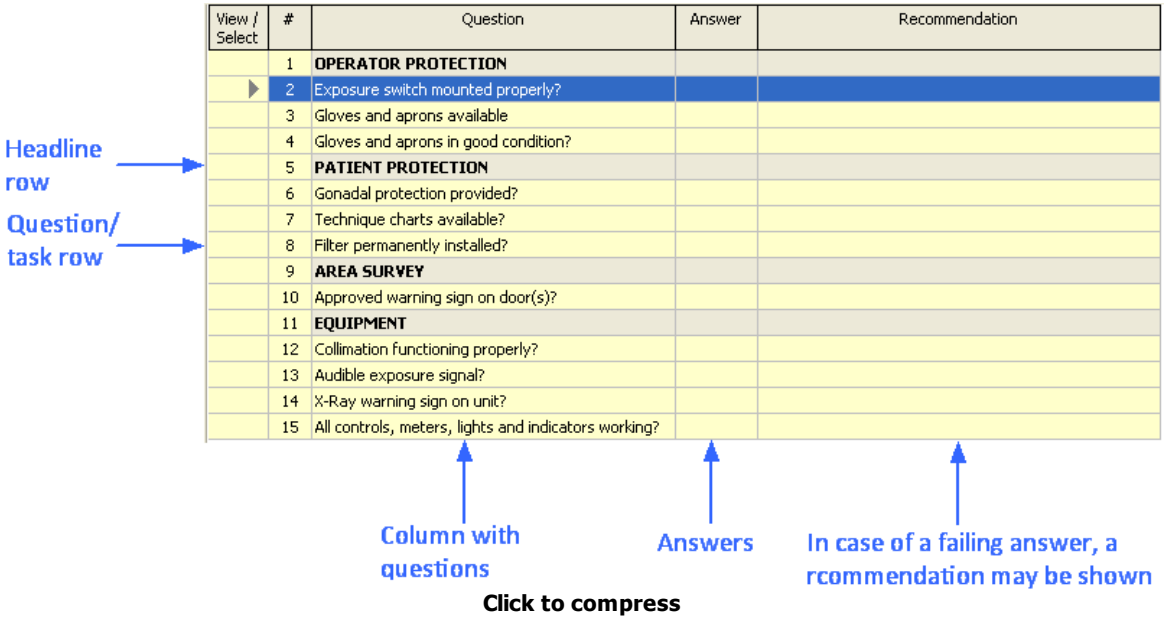
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A test template is a number of columns and rows (called the grid) describing the exposures that will be performed for a given test. There may also be some general settings present above the grid. The parameters specified here are valid for all rows in the grid. Each row is one exposure. There are measuring conditions and meter setting stored in the template for each exposure. There are columns allocated to store the measured date from the meter. The test also perform analysis of the measured data based on pass and fail criteria you decide on. We provided you with a group of generic templates for your use that come with Ocean, or you can create your own test templates to do accuracy, reproducibility, HVL, mA linearity, CTDI and so on. You can create test templates that do more than one task.

Read more on how to design a test template.

Checklist templates

A checklist template is a list with a number of questions or tasks.



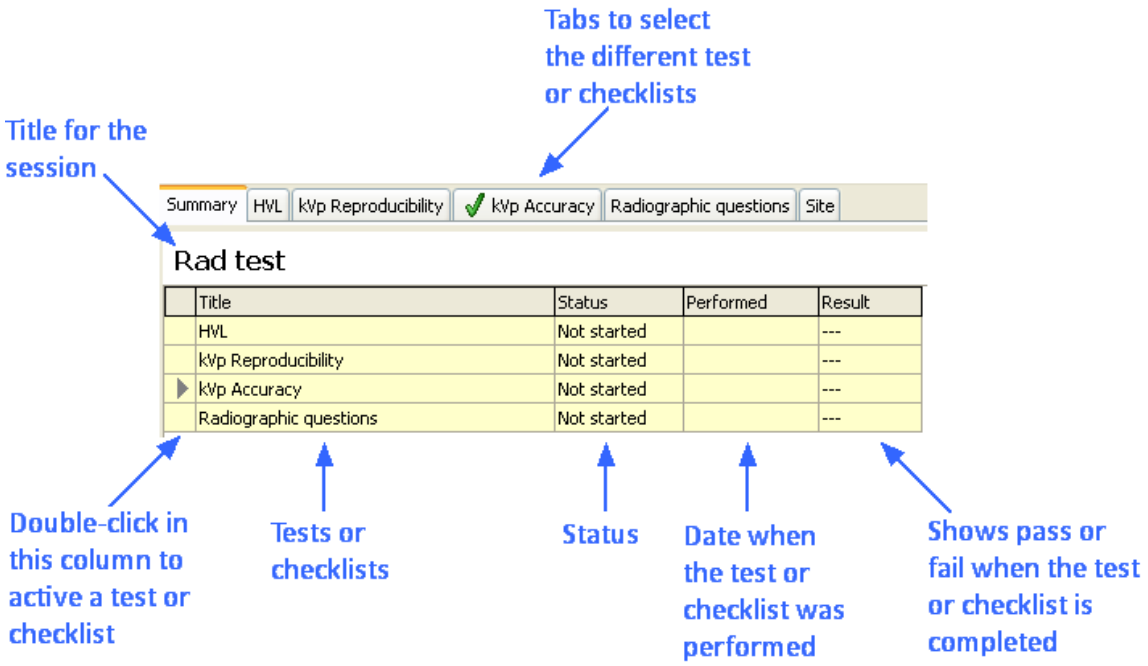
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The tasks/questions may be divided into sections separated by headings. The checklist is completely user-defined. Each question can have a predefined answer (up to six choices), a numeric answer or a text answer. You can defined what is acceptable to create pass and fail criteria. You can specify (optional) recommendations that should be shown in case of failing answers.

Read more on how to design a checklist template.

Session templates

A session template describes a complete job and is a collection of several test templates and/or checklist templates.



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The session has a summary page (shown in the picture) where all the included tests and/or checklists are shown. As soon as the session has been started (you have started your job) the site information is shown on a site tab. When you use your session template to perform a job, the columns Status, Performed and Result are indicating how you job progresses.

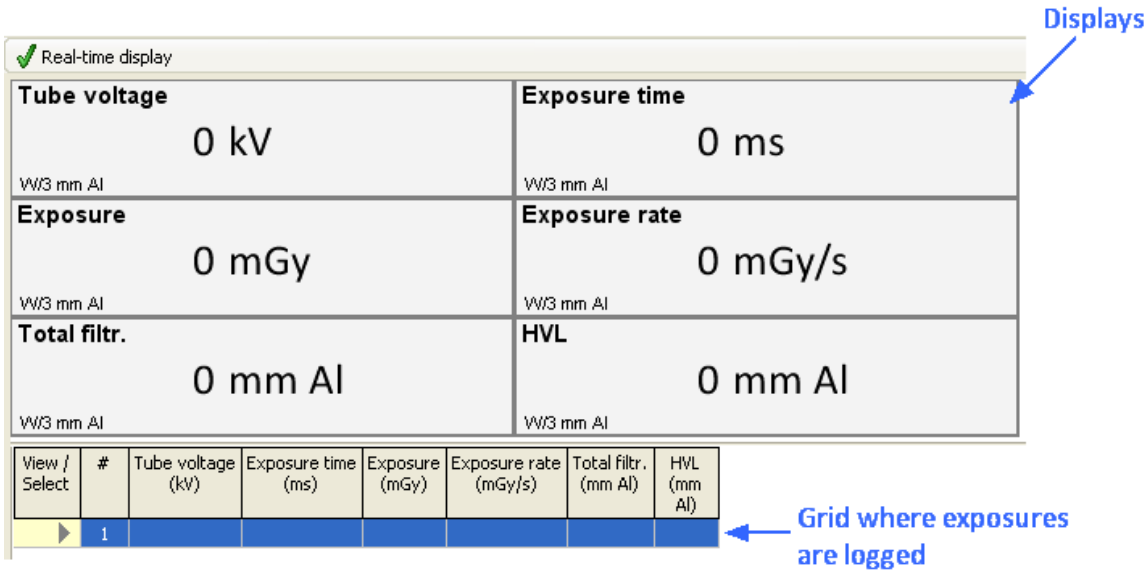
Status - shows automatically "Not started", "Started" and "Finished". You can set the status manually by right-clicking on a row to set it's status.
Performed - shows the date when you did the last measurement or answered the last question.
Result - shows pass or fail.

Note: A session template doesn't have this when you design it, only when you use it as a job.

Read more on how to design a session template.

Real-time display templates

A real-time display template describes a real-time display. It is completely user-defined.



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A real-time display template has a number of displays and a grid where the measured data is saved. Normally, the grid has only one row. A new row is created for each exposure you perform. You can only view old exposures not redo them.

The real-time display template works slightly differently, depending on the license level of Ocean you have. The differences are described in the table below:

license level	Description
Display	A real-time display template can have only one row. When you use it, the measured data is logged and a new row is automatically created for each exposure. It is not possible to go back and redo exposures, you can only view old measurements. No set values are possible to have in the grid.
Connect	You have all the features of the Display level, plus: With this license level you get access to some set values. You can also have real-time display templates with a number of pre-defined rows. You can specify individual conditions (set values and meter settings) for each row. You can also dump data into Microsoft Excel or OpenOffice Calc.
Professional	You have all the features of the Display and Connect levels, plus: With this license level you have access to all column types and analyses with pass and fail criteria for the real-time display template.

Read more on how to design a real-time display template.

3.2.2.1 Design a test template

You can design your own test templates to perform the measurements and analyses you want. They can be adapted to your own requirements and the meter you are using to maximize speed and user-friendliness. With correctly designed test templates you will finish your work quickly.

To design a test template involves the following steps:

1. Create the grid with the columns and general settings you need.
2. Enter set values in your test template.
3. Change order of columns.
4. Format numbers and change units for different parameters.
5. Modify meter settings according to measurement requirements.
6. Add supporting information (documents and web links).
7. Add analysis with pass/fail criteria.

3.2.2.1.1 Create grid and general settings

The general description of the grid is found in the Grid and general settings topic.

The first step, when designing any template is to create the grid (rows and columns) and the general settings (optional). You can design a template while you have your meter connected, or while you are in Keyboard mode with the meter not connected. There are advantages and disadvantages to both options but the final result and the function of your template will be the same in both cases.

Meter connected: If you have your meter connected, you will see exactly which modules, detectors and calibrations your meter has and you can build the template to suit your meter specifically. Also, you can, if you happen to be in an X-ray room, start making measurements while you design the template to make sure the template functions exactly the way you intended it to function. The draw-back to creating templates while Ocean is connected is that template creating is somewhat slower, as Ocean will

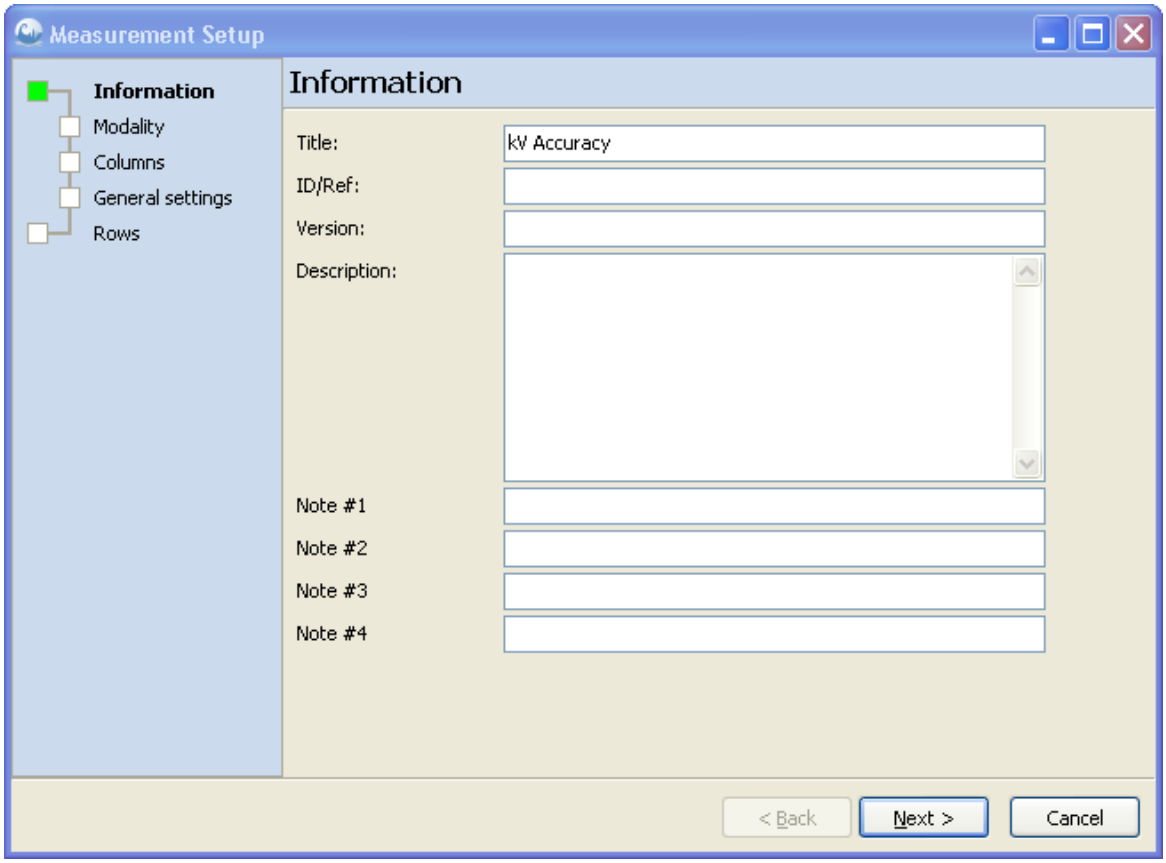
need to "talk" to the meter regularly and thereby slowing the process down somewhat.

Keyboard mode: If you use Keyboard mode, Ocean will create a "virtual" meter with all the capabilities of the Piranha and Barracuda (not just your own modules, calibrations and detectors). Since Ocean does not have to "talk" to your meter regularly, the design process is much faster in Keyboard mode, but the draw-back is that you will get a more generic template and not one built specifically for your meter. In this case, you must make sure that when you choose meter options and settings, you only use the detectors, probes and modules that your own meter has. You also need to make sure that Ocean uses the correct "virtual" meter (for example, if you have a Piranha, make sure Ocean uses the Piranha "virtual" meter). The meter type is shown in the left section of status bar #2. The other issue is that there is no way to test the template in Keyboard mode to see if it works the way you want it to work, since the template can only be tested when you hook up your meter to Ocean and then use the template.

In the example below, we'll show how to create the grid and general settings for a Piranha (the procedure is exactly same if you use a Barracuda):

1. Click on the Design page on the ribbon bar and select Test from the Template button.

2. The setup wizard will start and guide you through the process. You can now see that the bottom Status bar #2 is showing that you are creating a template in Design mode. The first thing any template needs is a title (for our example we'll use "kV Accuracy"). The title is the only field necessary on this page. The remaining fields are not used by Ocean, but they are provided for Ocean users to enter optional information. None of these fields, except the title, will appear in the report.

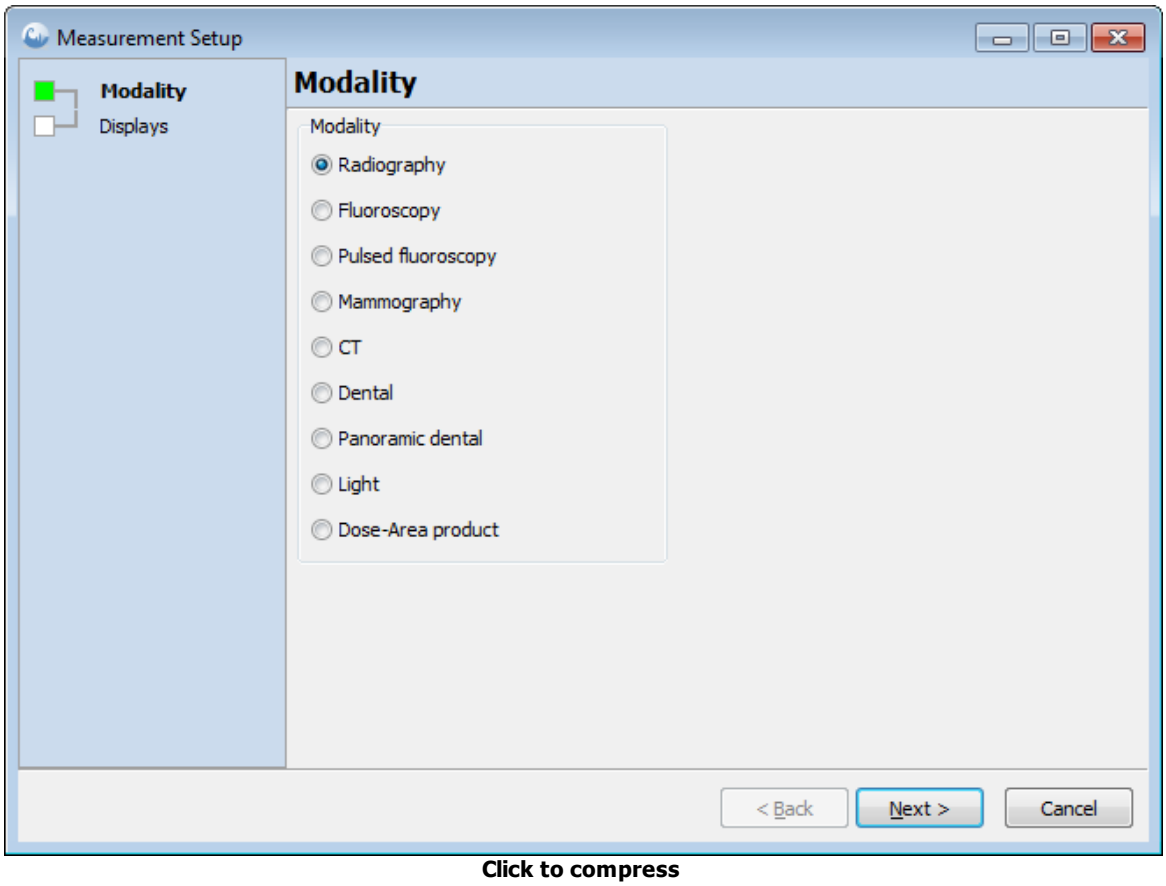


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The title of this template will be used to identify it in Ocean and when printing a report.

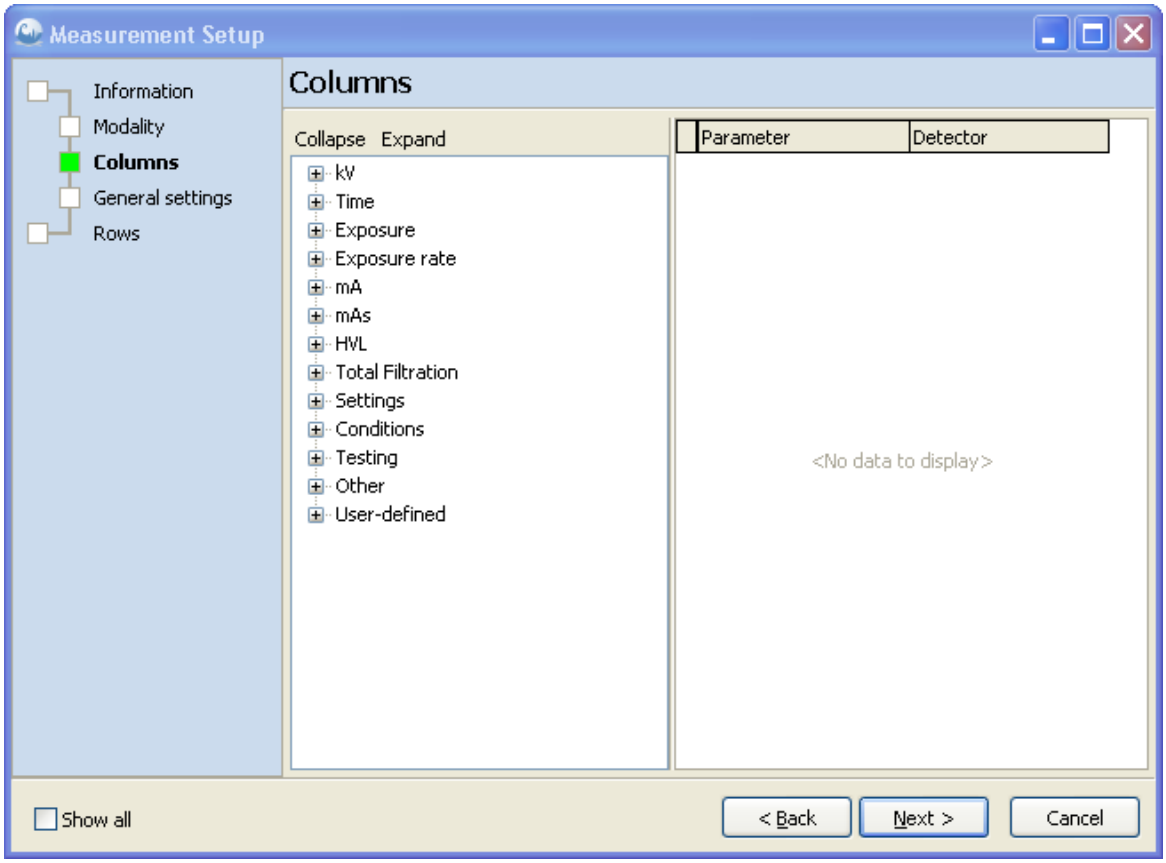
3. Let's enter the title "kV Accuracy" and click Next to continue with the wizard.

4. On this page of the wizard, we are asked to select modality. The modality information is used by Ocean to suggest the most suitable options to you during the design process. For our example, we'll select "Radiography" by clicking the radio button next to that choice, then click Next to continue with the wizard.



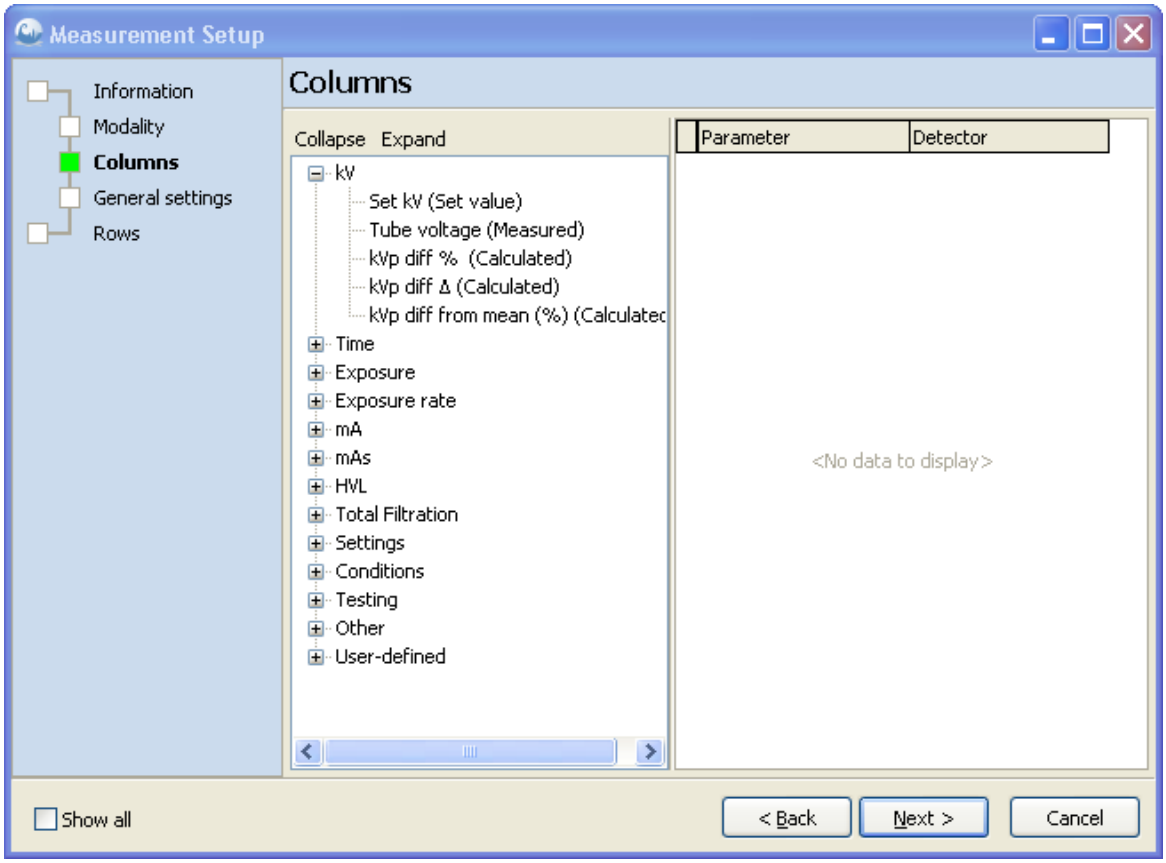
Click to compress

5. This window is the column selection window. This is where we select which measured value columns, set value columns and calculated value columns we want in our template. Since we are going to test kV accuracy, we need both set value and measured value columns as well as a column for calculation the difference between the set values and measured values. We also want to record exposure and time even if we don't need it for the kV accuracy test.



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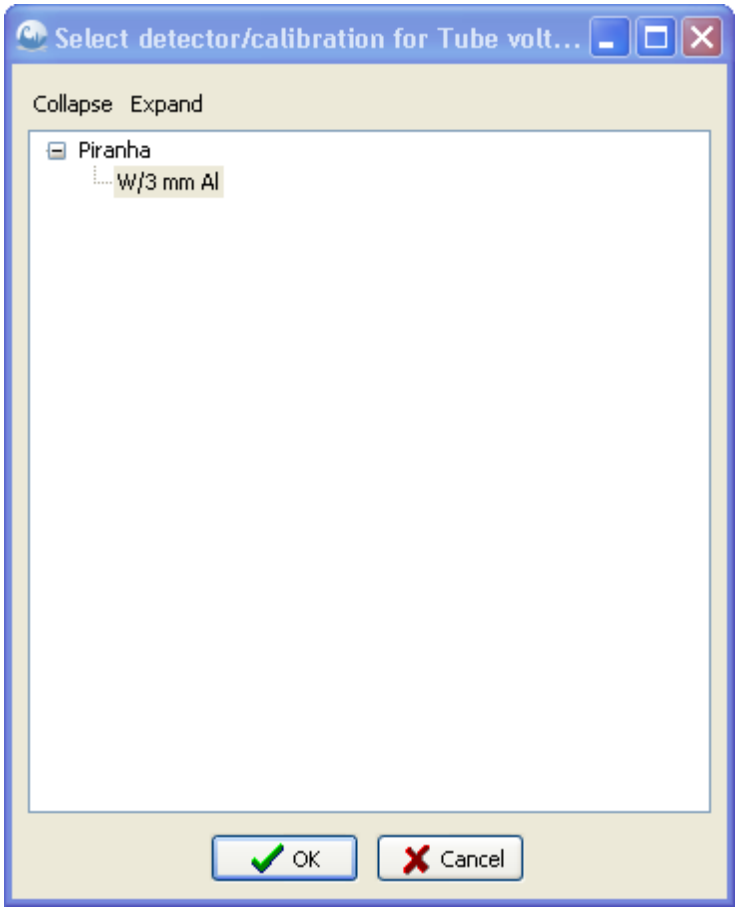
This picture shows the most common column groups for the modality we selected earlier. If you don't find what you need, check "Show all" in the lower left corner and everything will become visible. We'll click on "kV" to open this group of columns and choose "Set kV (Set value)" and "Tube voltage (Measured)".



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The columns on the right side will be the ones in our template. We can use drag-and-drop or double-click to move columns from the left to the right side. If you made an error and want to remove something from the right side, select it and hit the Delete key on your keyboard.

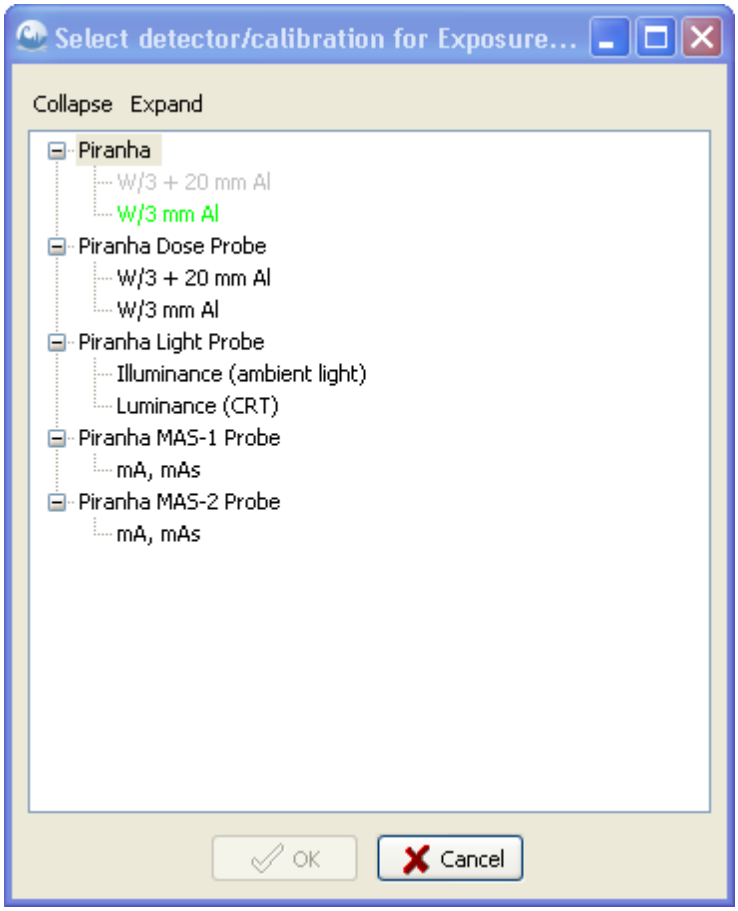
If you are following along with our example, you'll note that when we selected a measured parameter, as in the "Tube voltage (Measured)" column case, you'll see the next window below. This is where we choose which detector or calibration we intend to use with this template. Since we are using the Piranha, there is only one possible calibration to choose, we'll click on W/3 mm Al and click the OK button to continue with the wizard.



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We'll need to choose one more column from the kV group and that is the "kVp diff % (Calculated)" column so we can show the relative difference between the set value and the measured value.

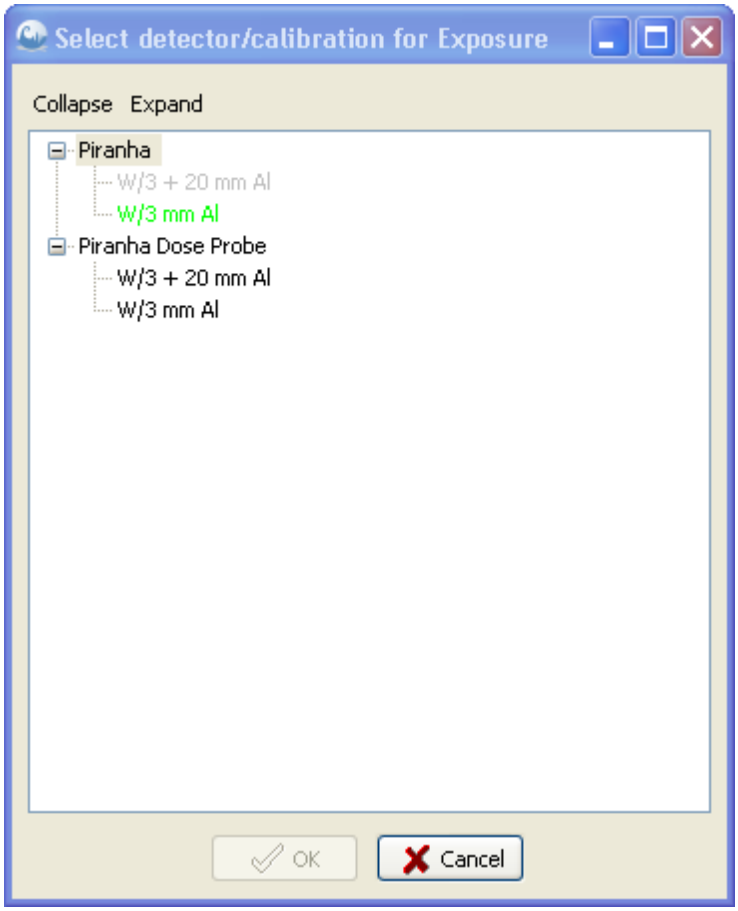
We also said we'll keep track of exposure time, even though we won't need it for this test, so we'll need to choose an appropriate column to reflect this value. Let's go to the Time group of columns and choose the "Exposure time (Measured)" column and we'll select an appropriate detector to use.



Click to compress

If you are in Keyboard mode and use a Piranha, the detector selection window looks like the picture above. All possible detectors with their calibrations capable of measuring exposure time are listed. Detectors/calibrations you have used already are highlighted in green. You want to measure the exposure time with the same detector as you use for the tube voltage, so click on Piranha(W/3 mm Al) to select it, then press OK to move to the next window.

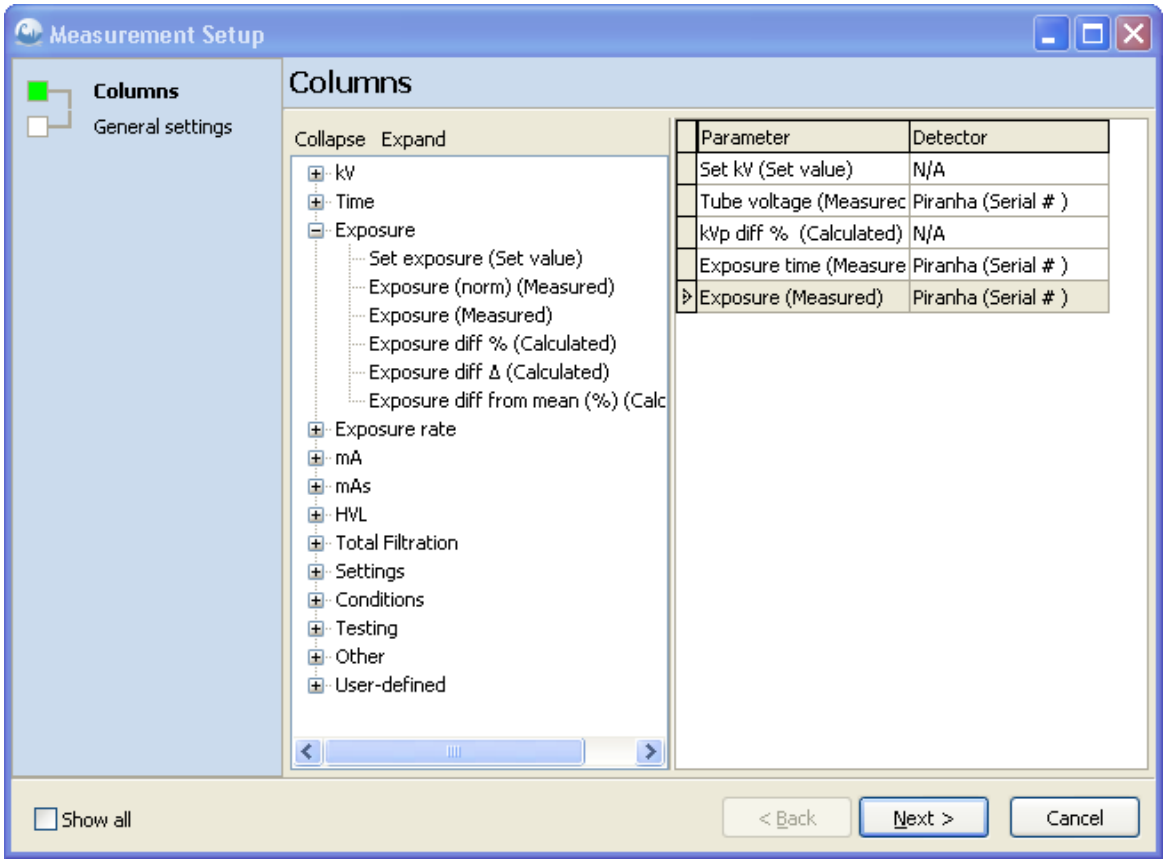
The last column we need for our example template is an Exposure column. We'll find one of these in the Exposure group of columns. Let's open the Exposure group of columns and choose the "Exposure (Measured)" column to complete our list of columns. For a detector choice, we'll use the same detector as we did before. Click on the W/3 mm Al choice and press OK to continue with the wizard.



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NOTE: If your meter is on-line you will only see the connected detectors.

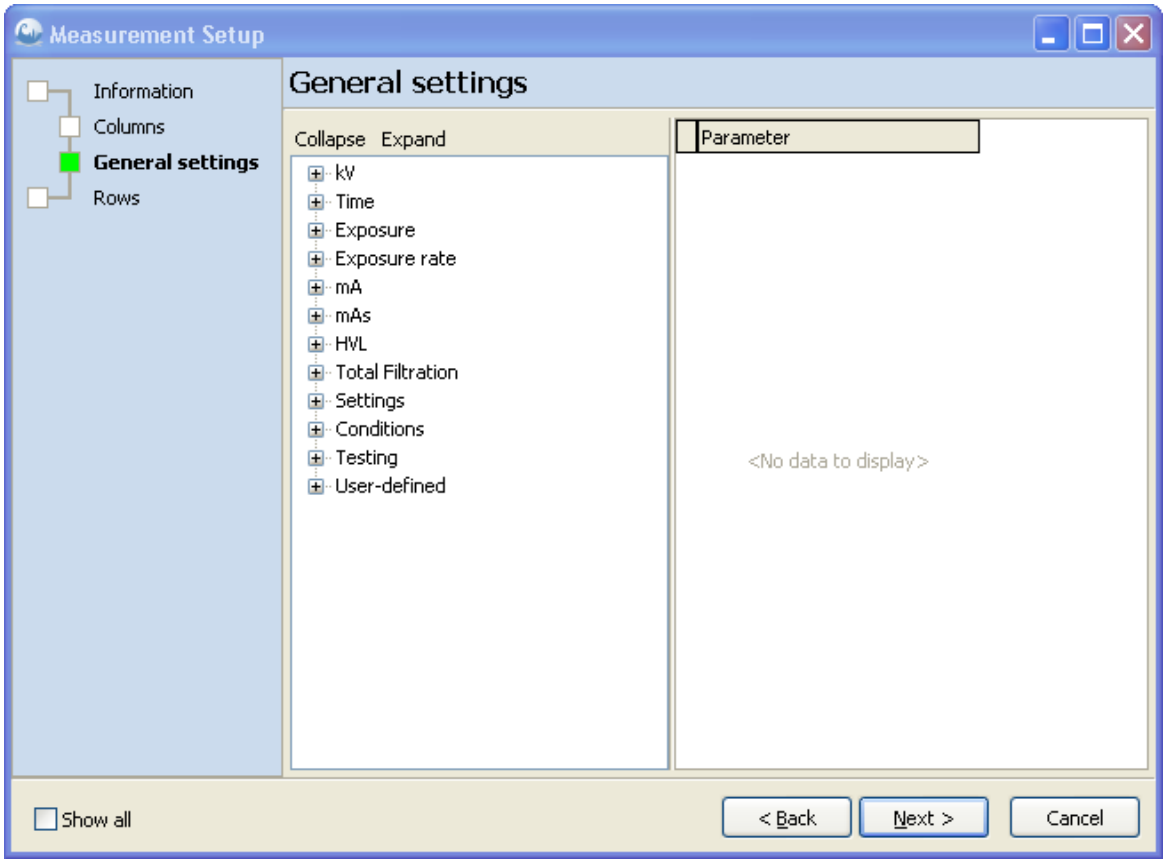
Your template design screen should look like the picture below after we made all the selections. We have chosen the four columns we need for our example, so we can click Next to continue with the wizard.



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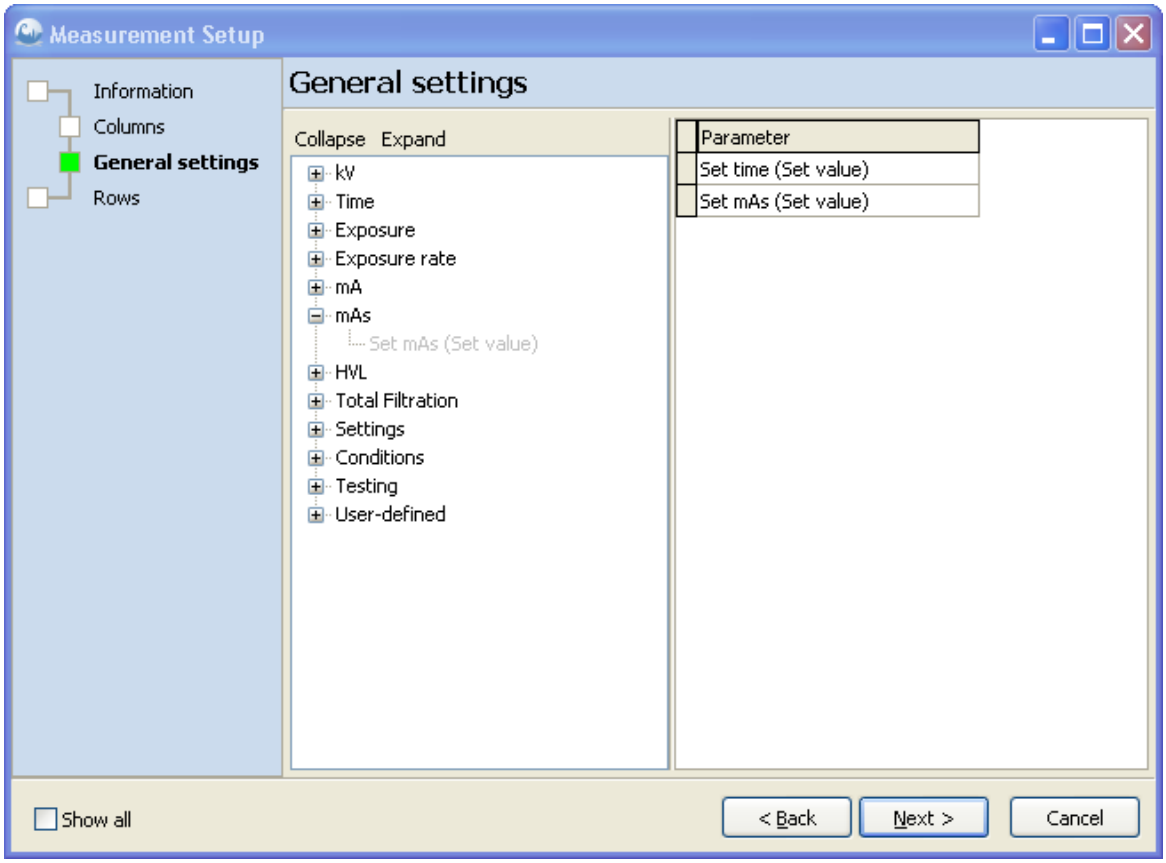
The next thing we need to do is to select the general settings.

General setting are set values you don't want in columns, since they don't change and show a constant value for all measurements. The picture below shows the General settings screen.



Click to compress

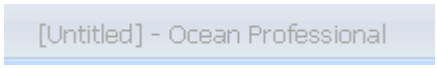
6. For set values, we will add "Set time" and "Set mAs". To do this, we'll click the Time group first and select "Set time" from the choices, then click the mAs group and choose "Set mAs" from the choices. Our screen should look like the picture below now, and we can click Next to continue with the wizard.



Click to compress

7. The final step in creating the grid is to choose how many rows we want. For our example, we will test 40, 60, 80, 100, 120 and 140 kV stations, so we'll need six rows in all. We'll enter 6, then click Finish to end the wizard.

It is a good idea to save our work at this stage. If you look at the main title bar, you can see that our work was not yet saved.



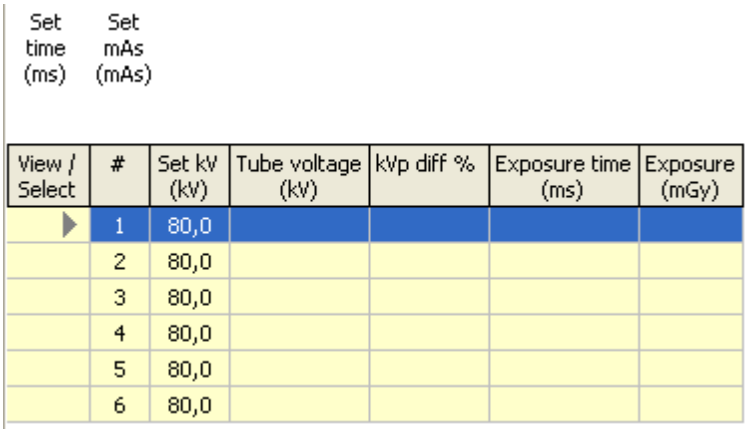
It has no name yet. The square brackets around the name indicates that this is a template. To save our work so far, we can either click the Save button on the Quick Access Toolbar or go to the Application menu and select the Save option.

We are asked to choose a name to be used in the Test template folder of the Library. For our example we chose "kVAcc_6Exp" as the name for our work. As soon as our work is saved, the template is now referred to by name, and that name is shown on the main title bar.



NOTE: **No measured values** are saved when you save a template.

At this stage, our example template should look like the picture below. However, before this template can be used, there are a few more things we'll need to add, and some optional things you may choose to add to your template, depending on your preference.



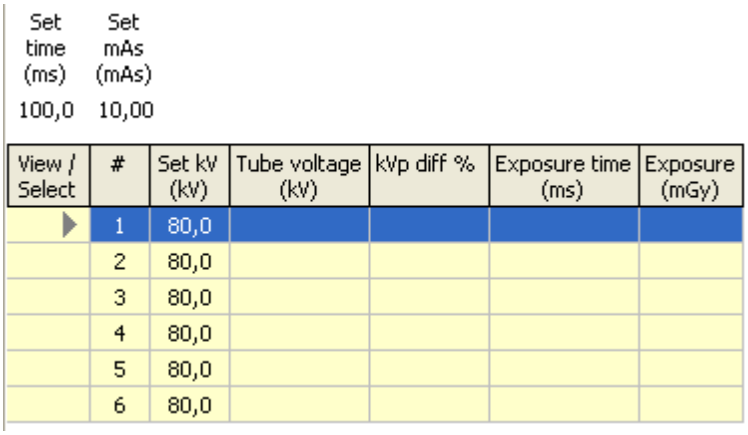
Set time (ms)	Set mAs (mAs)

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
▶	1	80,0				
	2	80,0				
	3	80,0				
	4	80,0				
	5	80,0				
	6	80,0				

Click to compress

Before we can use this template, we still need to do the following activities:

1. Let's assume we want to use an exposure time of 100 ms and we want to do our kV accuracy calculation at 10 mAs. To add these values to our template, we'll click first below the "Set time" words and enter 100, then click below the "Set mAs" words and enter 10. When we are done, our grid should look like this:

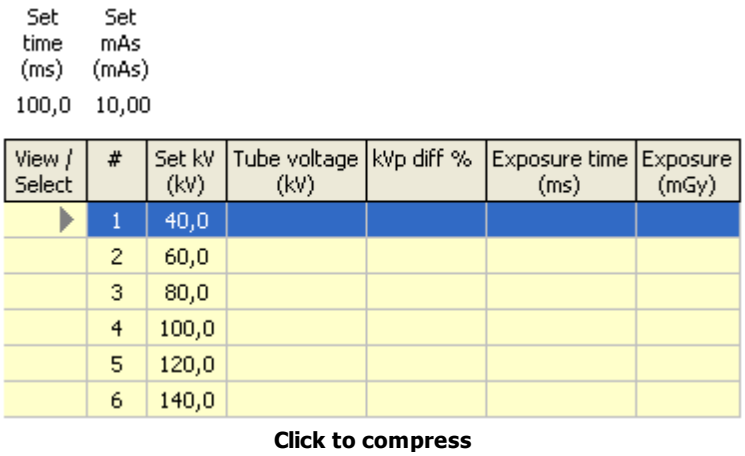


Set time (ms)	Set mAs (mAs)
100,0	10,00

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
▶	1	80,0				
	2	80,0				
	3	80,0				
	4	80,0				
	5	80,0				
	6	80,0				

Click to compress

2. The next thing we need to do is to populate the "Set kV" column so it reflects all six values we would like to measure. To do this, we'll click in the "Set kV" column's first row and enter the value 40, below 40, we'll enter 60... and so on until we entered all the values. Our grid should now look like this:



Set time (ms)	Set mAs (mAs)
100,0	10,00

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
▶	1	40,0				
	2	60,0				
	3	80,0				
	4	100,0				
	5	120,0				
	6	140,0				

Click to compress

This template is now ready for use, nothing more needs to be done to it. However, there are a number of optional adjustments you may choose to do according to your own preference. These optional

settings are discussed below.

You have the following optional choices available to you:

- Remove decimals from the set values.
- Change the order of columns.
- Change the unit of measured parameters.
- Change the text of the column heading of columns.
- Change the width of columns.
- Modify the meter settings of individual exposures.
- Add a hint that should be shown to the person who uses this template.
- Add supporting documentation with test instructions that the person who uses this template can read if he needs help performing the test.
- Add an analysis to a template.
- Prepare the test for the report.

You will find instructions on how to do each of the above optional activities below:

1. To remove decimals from the set values, right-click on a heading (column or general settings). From the menu select "Decimals" and select "0 decimals". If you don't know how the column is formatted currently, just start entering values into the column.

2. To change the order of columns (or of values in general settings), just use the drag-and-drop method. Place the cursor over the heading and just drag it to the desired location, then let go and the column will be repositioned accordingly.

3. To change the unit of a column or value in the general settings, right-click on the heading and select "Unit" to change change to another unit of measure.

4. To change a column heading, right-click on it and select the "Edit column title" choice, then type the new column title and click OK to save.

5. To change column width, just click on a horizontal line and drag it over to the desired new position, then release your mouse and the new column width will be set.

6. How to modify the meter settings is described here...

7. How to to add a hint is described here...

8. How to add supporting information to a template is described here...

9. You may want to add some kind of analysis (calculation) with pass/fail criteria to your test. How to add an analysis to your template is described here...

10. There are things you can do in the test template that will have affect on how it appears in the report. Read more about this topic here...

NOTE: It is a good idea to save your data often so you don't lose any of your work. To save your template, go to the Application button and select Save from the drop-down menu or click the Save button on the Quick Access toolbar, and enter a name when prompted.

3.2.2.1.2 Select multiple rows

When you have a template containing a lot of rows, or when you want to make the same changes to several rows in your template, the multiple row selection function is a way to speed up your work. The multiple row selection function is illustrated with the following example.

Let's assume we have the following template, and we want to change the "Set time" to 200 ms for rows 2, 3, 4, 5 and 7.

View / Select	#	Set kV (kV)	Set time (ms)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)
▶	1	80	100,0		
	2	80	100,0		
	3	80	100,0		
	4	80	100,0		
	5	80	100,0		
	6	80	100,0		
	7	80	100,0		

Click to compress

We could do these changes one row at a time, but the multiple row selection is a much more efficient way to do the same thing faster. To select multiple rows, do the following:

1. Activate row #2 by clicking in the left column.

View / Select	#	Set kV (kV)	Set time (ms)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)
	1	80	100,0		
▶	2	80	100,0		
	3	80	100,0		
	4	80	100,0		
	5	80	100,0		
	6	80	100,0		
	7	80	100,0		

Click to compress

2. Now hold down the Shift key and click (in the left column) on row #5. This will select all of the rows between #2 and #5 inclusively.

View / Select	#	Set kV (kV)	Set time (ms)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)
	1	80	100,0		
	2	80	100,0		
	3	80	100,0		
	4	80	100,0		
▶	5	80	100,0		
	6	80	100,0		
	7	80	100,0		

Click to compress

3. To add the last row, hold down the Ctrl key and click on row #7.

View / Select	#	Set kV (kV)	Set time (ms)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)
	1	80	100,0		
	2	80	100,0		
	3	80	100,0		
	4	80	100,0		
	5	80	100,0		
	6	80	100,0		
▶	7	80	100,0		

Click to compress

To finish our example, we'll change the time to 200 ms for the selected rows. We do this by:

1. right-clicking on the column heading for "Set time" and choose the "Set value for cells" option.
2. Enter 200 in the dialogue box, then click OK and you are done.

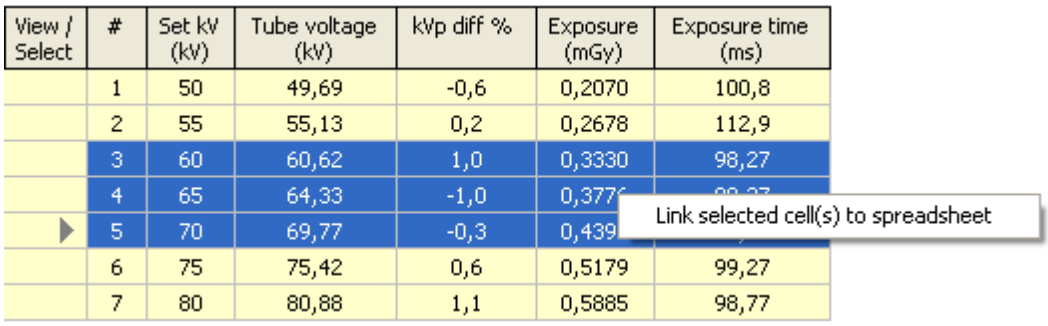
View / Select	#	Set kV (kV)	Set time (ms)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)
	1	80	100,0		
	2	80	200,0		
	3	80	200,0		
	4	80	200,0		
	5	80	200,0		
	6	80	100,0		
▶	7	80	200,0		

Click to compress

As you can see in the picture above, all of our selected rows now show 200 ms instead of 100 ms

Right-click menu

You can also select multiple rows and right-click on the selection:



Click to compress

A menu is shown with operations you can perform on selected rows.

3.2.2.1.3 Select multiple cells

When you have a template containing a lot of cells, or when you want to make the same changes to several cells in your template, the multiple cell selection function is a way to speed up your work. The multiple cell selection function is illustrated with the following example.

Let's assume we have a template like the one below, and we want to link a block of cells from this template to an Excel (or OpenOffice Calc) spreadsheet. We could do this one cell at a time, but that would be time-consuming and inefficient. Instead, we'll use Ocean's multi-cell select function. To use this function, follow the steps below:

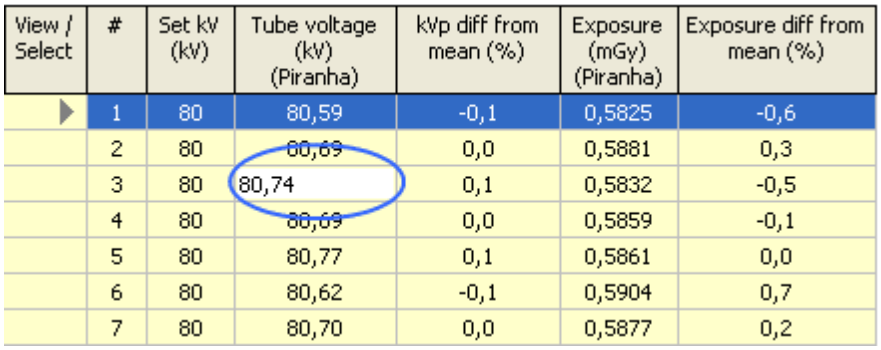
View / Select	#	Set kV (kV)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)	Exposure (mGy) (Piranha)	Exposure diff from mean (%)
▶	1	80	80,59	-0,1	0,5825	-0,6
	2	80	80,69	0,0	0,5881	0,3
	3	80	80,74	0,1	0,5832	-0,5
	4	80	80,69	0,0	0,5859	-0,1
	5	80	80,77	0,1	0,5861	0,0
	6	80	80,62	-0,1	0,5904	0,7
	7	80	80,70	0,0	0,5877	0,2

Click to compress

First, select a cell in the spreadsheet. This will be the upper left corner of where the block will be linked. Now go back to Ocean.

In Ocean, do the following:

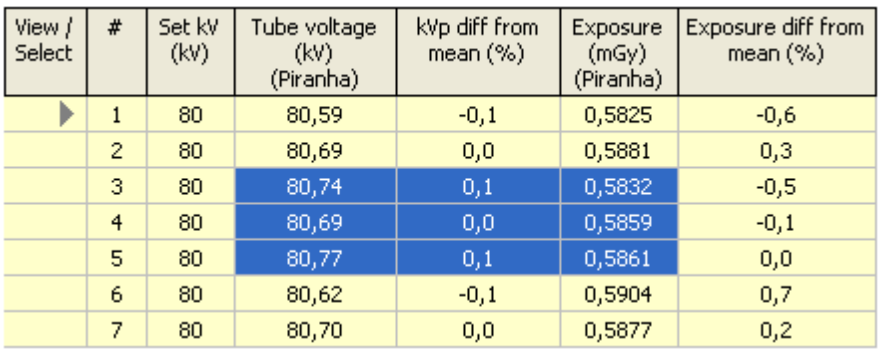
1. Click on the first cell you want. This will be the upper left corner of the block you want to link.



View / Select	#	Set kV (kV)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)	Exposure (mGy) (Piranha)	Exposure diff from mean (%)
▶	1	80	80,59	-0,1	0,5825	-0,6
	2	80	80,69	0,0	0,5881	0,3
	3	80	80,74	0,1	0,5832	-0,5
	4	80	80,69	0,0	0,5859	-0,1
	5	80	80,77	0,1	0,5861	0,0
	6	80	80,62	-0,1	0,5904	0,7
	7	80	80,70	0,0	0,5877	0,2

Click to compress

2. Hold down the Shift key and click the cell that will be the right lower corner of the block you want to link. As you can see in the picture below, a block of nine cells are highlighted dark blue.



View / Select	#	Set kV (kV)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)	Exposure (mGy) (Piranha)	Exposure diff from mean (%)
▶	1	80	80,59	-0,1	0,5825	-0,6
	2	80	80,69	0,0	0,5881	0,3
	3	80	80,74	0,1	0,5832	-0,5
	4	80	80,69	0,0	0,5859	-0,1
	5	80	80,77	0,1	0,5861	0,0
	6	80	80,62	-0,1	0,5904	0,7
	7	80	80,70	0,0	0,5877	0,2

Click to compress

3. Now right-click on the marked block.

View / Select	#	Set kV (kV)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)	Exposure (mGy) (Piranha)	Exposure diff from mean (%)
	1	80	80,59	-0,1	0,5825	-0,6
	2	80	80,69	0,0	0,5881	0,3
	3	80	80,74	0,1	0,5832	-0,5
	4	80	80,69	0,0	0,5859	-0,1
	5	80	80,77	0,1		
	6	80	80,62	-0,		
	7	80	80,70	0,0	0,5877	0,2

Don't show value(s)
Link selected cell(s) to spreadsheet

Click to compress

4. From the drop-down menu, choose the "Link selected cell(s) to spreadsheet" option, and the nine cells will be linked to your spreadsheet, beginning at your cursor position in the spreadsheet. The cursor position in the spreadsheet will be the upper left corner of the linked block.

3.2.2.1.4 Add/delete rows

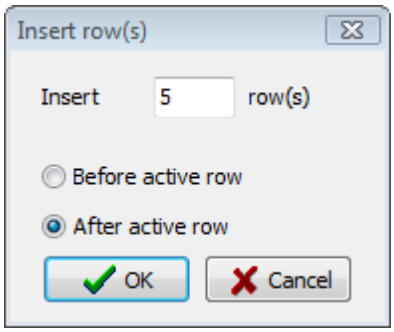
The functions needed to insert or delete rows are found on the Design page of the ribbon bar:

Add row(s)

1. Click in the left column to select where you want to insert new rows.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %
	1	50		
	2	60		
	3	70		
	4	90		
	5	110		

2. Go to the Design page on the ribbon and choose the "Insert row(s)" function.



3. A window will pop up like the one above where you can choose the number of row(s) you want to insert and if the new row(s) should be inserted before or after the selected row. Click OK when finished.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %
	1	50		
	2	60		
▶	3	70		
	4	70		
	5	70		
	6	70		
	7	70		
	8	70		
	9	90		
	10	110		

-End-

Delete row(s)

1. Select the row(s) you want to delete.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %
▶	1	50		
	2	60		
	3	70		
	4	70		
	5	70		
	6	70		
	7	70		
	8	70		
	9	90		
	10	110		

2. Go to the Design page on the ribbon and choose the "Delete row(s)" option.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %
▶	1	60		
	2	70		
	3	70		
	4	90		
	5	110		

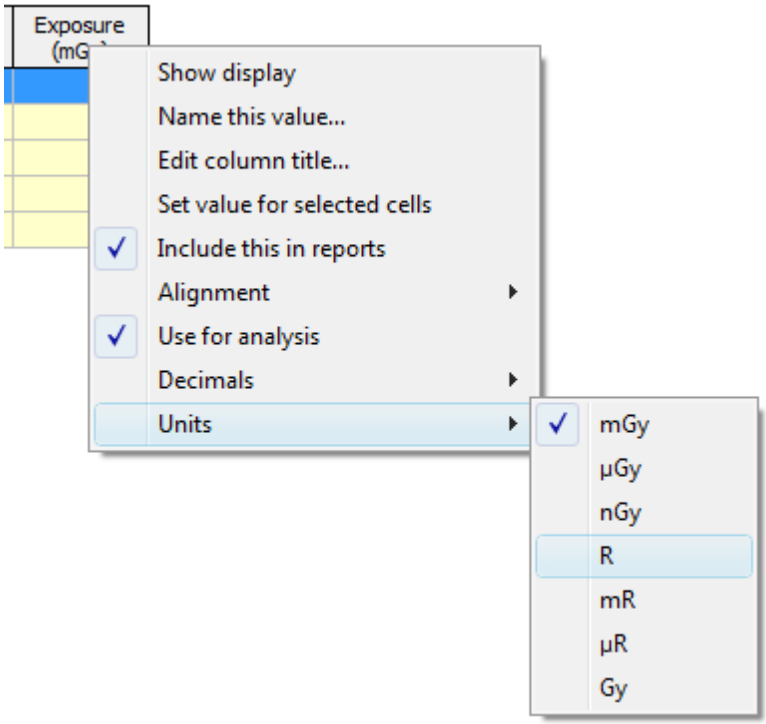
-End-

3.2.2.1.5 Change unit

Let's assume we have a template like the one below and we want to change the unit from mGy to R. To do this, follow the steps below:

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)
	1	60			
	2	70			
	3	70			
	4	90			
	5	110			

1. Right-click on the heading of the column whose unit you want to change, and a drop-down list will appear like the one below with a variety of options.



2. Under the units, there is another drop-down list from which you can select the unit you want, and your new column unit will be changed to your selection. In our example we will choose R and as you can see in the Exposure column below, the mGy has been replaced by R as we wanted.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (R)
	1	60			
	2	70			
	3	70			
	4	90			
	5	110			

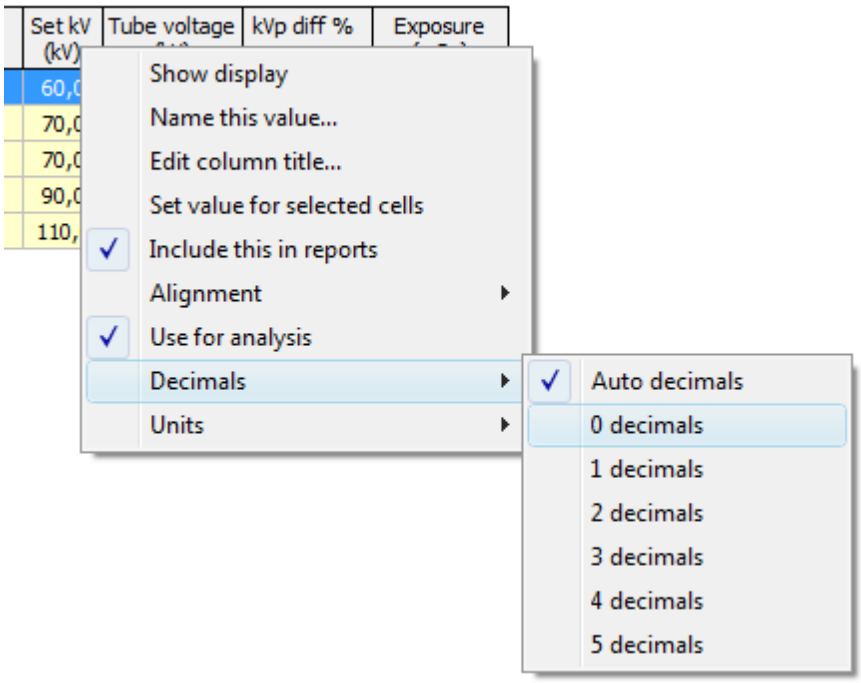
3.2.2.1.6 Change numeric format

This topic deals with changing the numeric format of a column.

Let's assume we have a template like the one below and we want remove the decimals of the kV set values. To do this, we'll do the following:

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)
▶	1	60,0			
	2	70,0			
	3	70,0			
	4	90,0			
	5	110,0			

1. Right-click on the heading of the column whose numeric format you want to change, and a drop-down menu is displayed with a number of available choices. To change the numeric format, choose the Decimals option.



2. Another drop-down list is displayed with the available decimal point selections. For our example, we'll choose the first option (zero decimals), since we did not want to show decimals in the Set kV column. Our template will look like this after we are done.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)
▶	1	60			
	2	70			
	3	70			
	4	90			
	5	110			

3.2.2.1.7 Change detector

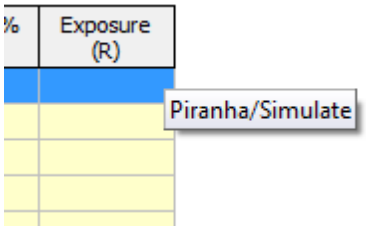
When you create the grid you select which detector you will use for each measured parameter. This choice can be changed at any time during the test template design process or, if necessary, later by the user when he uses the template.

The following example will deal with how to change a detector selection.

Let's assume we have a template with the following columns and rows already created, but we want to change to a different detector than this template was designed with.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (R)
▶	1	60			
	2	70			
	3	70			
	4	90			
	5	110			

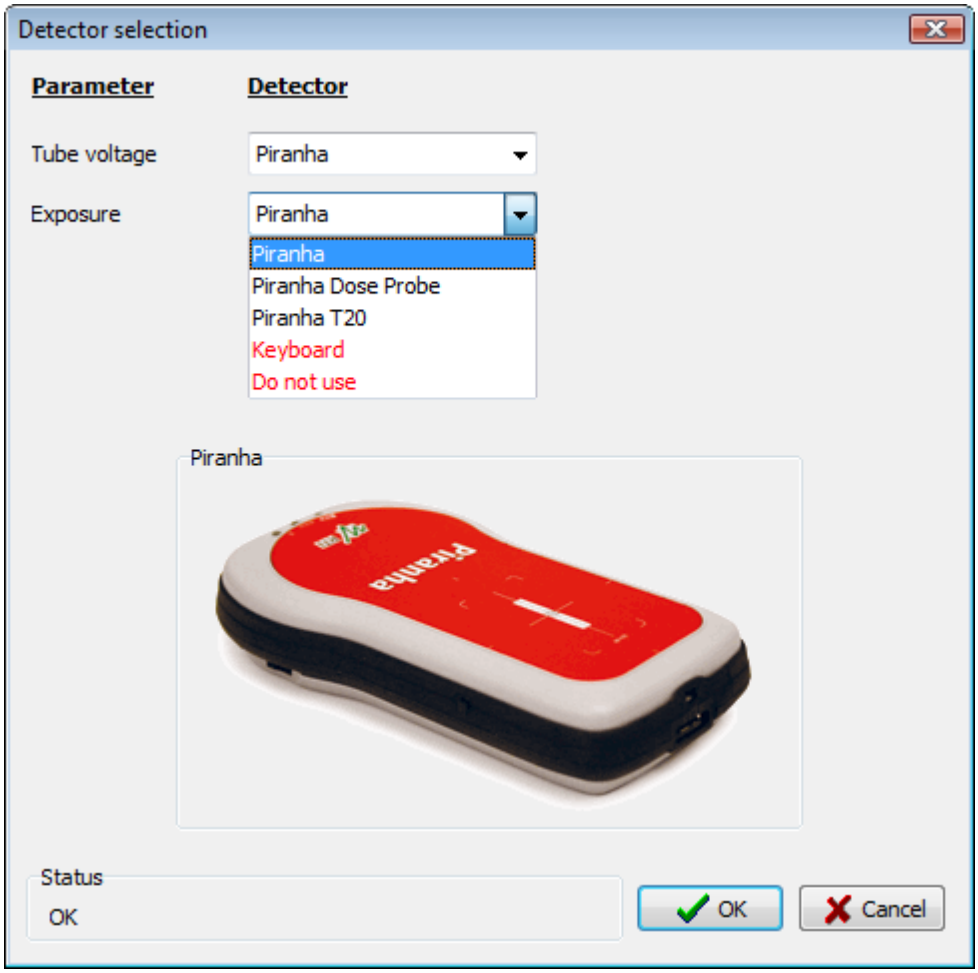
You can move the mouse pointer over the headings of the "measured" columns to see what detector is currently selected (in this example the Piranha is used, but the procedure is similar with the Barracuda).



When your meter is connected, the actual detector name and serial number are shown (if you are working "off-line" with no meter connected, "Simulate" is shown instead).

Getting back to our example, to change to a different detector, we'll use the following steps:

1. The first step is to go to Miscellaneous on the ribbon bar and click on Detector, and the detector selection dialogue is shown (see picture).



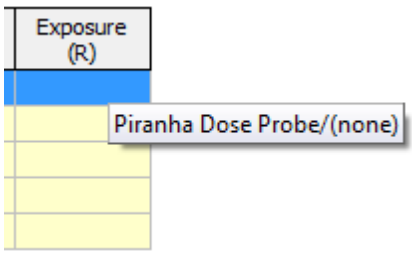
Click to compress

When you are "off-line", the drop-down list with show all possible detectors for your meter and there may be detector types shown in the list that you don't have. If you are "on-line", the list will show only the detectors your meter has available.

Piranha: only the connected detector is shown
Barracuda: all detectors you have will be shown whether they are connected or not

2. For our example, we'll select the "Piranha Dose Probe" and click OK to continue.

You can confirm that a new detector is selected for the Exposure column by placing the mouse pointer over the heading.



3.2.2.1.8 Modify meter settings

Meter settings can be set individually for each row in a template. To define meter settings:

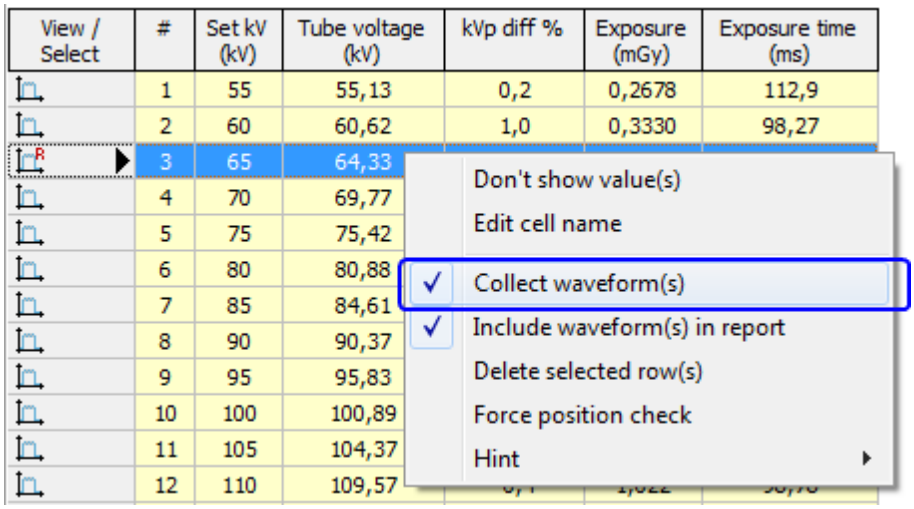
1. Select the row(s) you want to change the meter settings for. You can select multiple rows if you want.

2. Pull out the tab from the right side that has the meter setting(s) you want to modify. Read more here...

3. Make the necessary changes.

3.2.2.1.9 Waveforms

Waveforms are be default measured. You can turn off and on this individually for each row. This is done by right-clicking on a row and check or uncheck "Collect waveforms(s)".

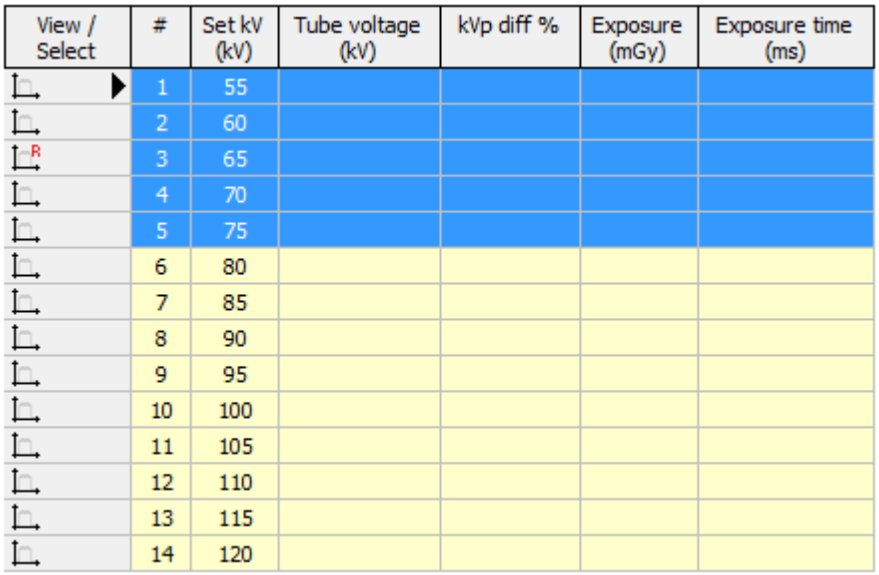


Click to compress

You can also select multiple rows and check or uncheck several rows at the same time.

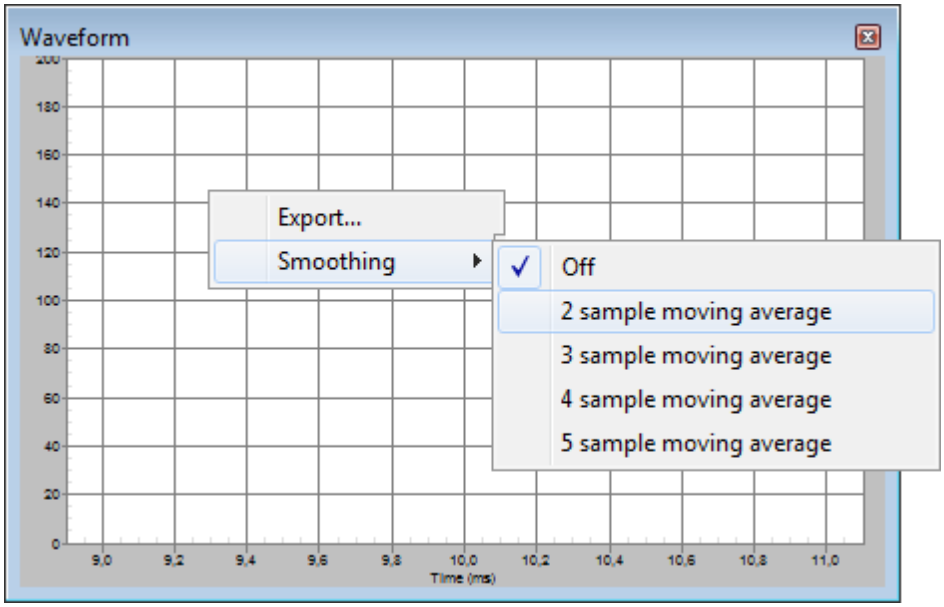
The waveform is shown in a separate window. You can add filtering to it if you have a noisy waveform. The setting for the filter is stored individually for each row. To add smoothing:

1. First select the rows you want (in this case the first five rows).



Click to compress

2. Right-click on the waveform windiow.



Click to compress

3. Select the amount of smoothing you want to have.

This option is also available when you do measurements and you can also add smoothing "on-the-fly".

3.2.2.1.10 Hints

Ocean has the ability to add hints to your templates to provide help for the user who will work with your templates. The hint is a message that will pop up automatically if certain situations arise, and can be turned off in the Program Options if desired. A common hint is to remind people to remove the filters from the beam after they have finished with the half-value layer test. The picture below shows this hint.



Click to compress

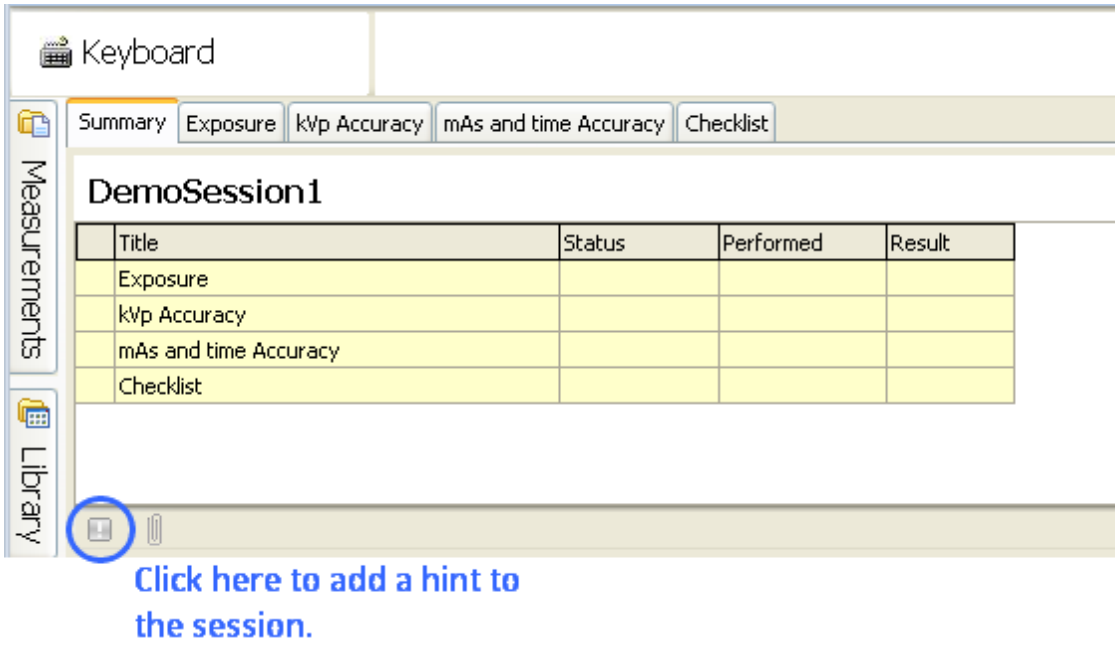
You can insert hints in the following places:

- Session - it will be shown when you start a session.
- Test or checklist - it will be shown when the test or checklist is started.
- Row - it will be shown when the row becomes active.

Add a session hint

1. Go to the session summary page and click on the "Add hint" icon located on the lower left part of the session summary page.

NOTE: This icon is grayed out when there is no hint present, but you can still click on it and add a hint.



Click to compress

2. An edit window is shown where you can add the text you want. You can format the text and add pictures if as you like. You can also resize the window to the size you want it to have when it is shown to users in the template. Once you are done, click OK to close the edit window.

The Hint icon now shows that a hint is present in a row (see the picture).



You can right-click on the hint and select "Show" to see what it looks like when it is displayed to the user..

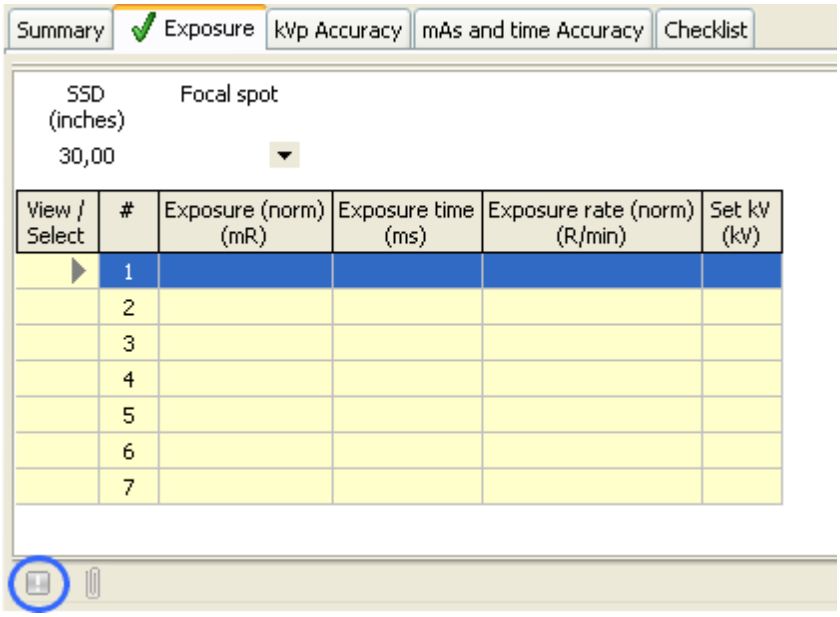
-End-

Add a test or checklist hint

1. Activate a test or checklist.

2. Click on the "Add hint" icon located in the lower left part of the screen.

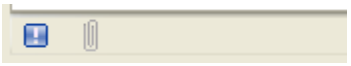
NOTE: This icon is grayed out when there is no hint present, but you can still click on it and add a hint.



Click to compress

2. An edit window is shown where you can add the text you want. You can format the text and add pictures if as you like. You can also resize the window to the size you want it to have when it is shown to users in the template. Once you are done, click OK to close the edit window.

The Hint icon now shows that a hint is present in a row (see the picture).



You can right-click on the hint and select "Show" to see what it looks like when it is displayed to the user.

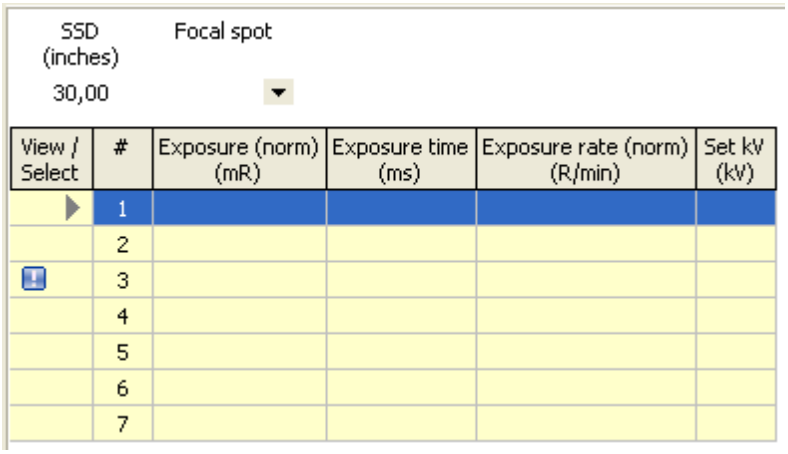
-End-

Add a row hint

1. Right-click on a row and select "Hint, then Add".

2. An edit window is shown where you can add the text you want. You can format the text and add pictures if as you like. You can also resize the window to the size you want it to have when it is shown to users in the template. Once you are done, click OK to close the edit window.

The Hint icon now shows that a hint is present in a row (see the picture)



Click to compress

You can right-click on the hint and select "Show" to see what it looks like when it is displayed to the user.

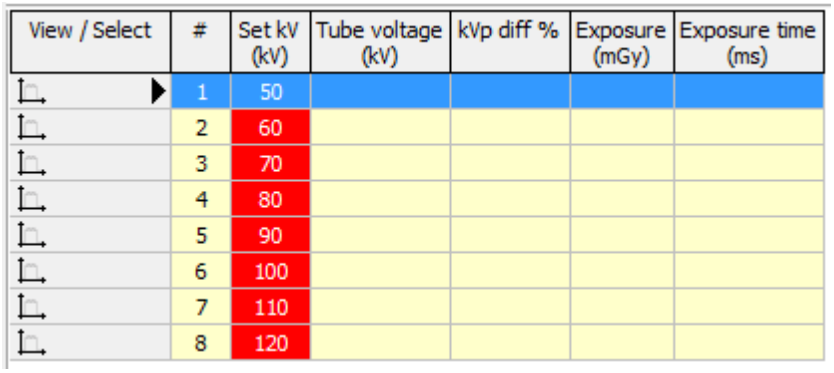
-End-

Edit or delete a hint

Right-click on the hint indicator and select "Edit" or "Delete" from the menu.

3.2.2.1.11 Change cell color

You can change color (background and font) on individual cells in the grid to increase visibility (on the computer screen):



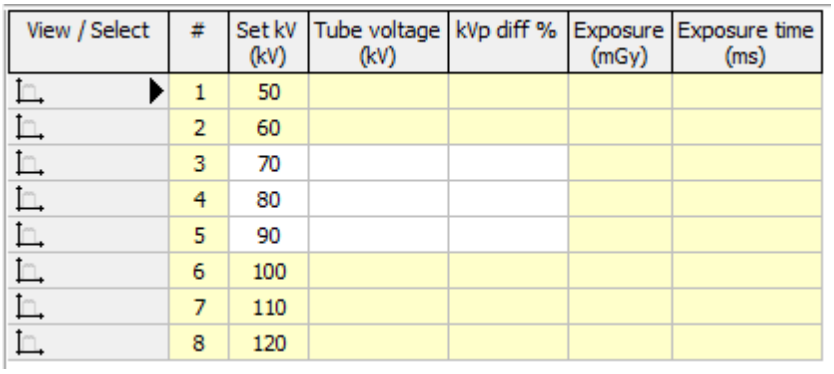
View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)
	1	50				
	2	60				
	3	70				
	4	80				
	5	90				
	6	100				
	7	110				
	8	120				

Click to compress

Note that the colcor indication is only shown on the computer screen, not in the report.

To change background and/or font color:

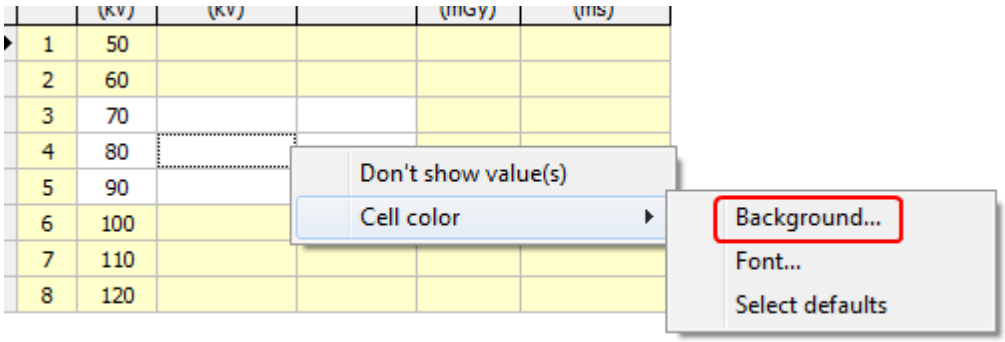
1. Select the cells you want to change color for:



View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)
	1	50				
	2	60				
	3	70				
	4	80				
	5	90				
	6	100				
	7	110				
	8	120				

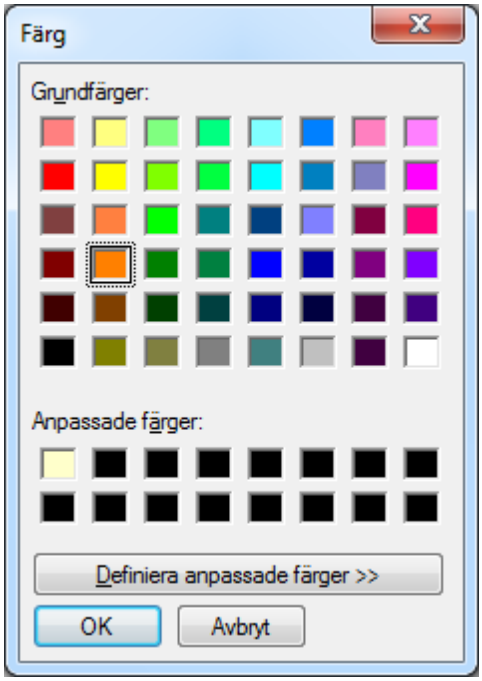
Click to compress

2. Right-click and select Cell color -> Background



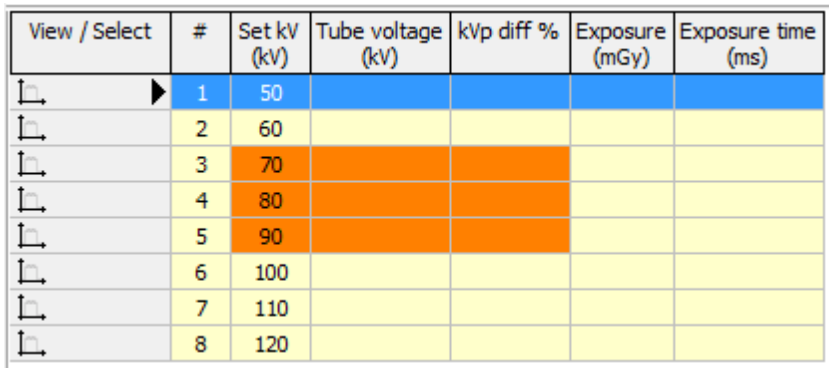
Click to compress

3. Select a color and click OK



Click to compress

The cells get the new background color:



Click to compress

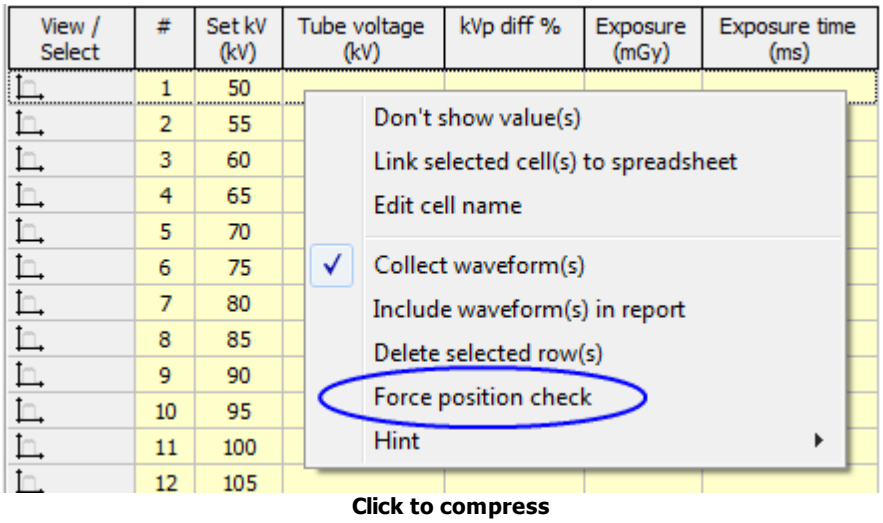
If you want to reset to standard colors, chose Select defaults from the menu.

3.2.2.1.12 Forced position check

You can use "forced position check" if you want to make sure that you (or somebody else using the templates you design) don't forget to do the position check.

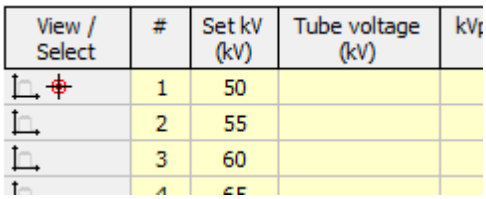
1. Right-click on the row where you want to do the position check.

2. From the menu select "Force position check".



Click to compress

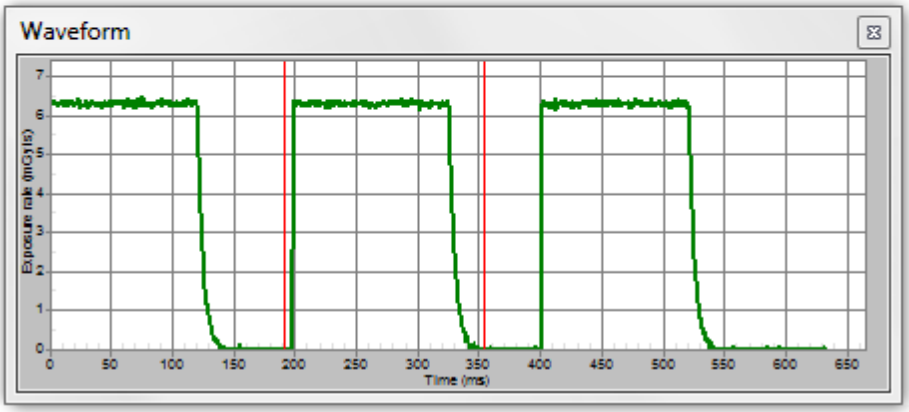
3. An icon in the view/select column indicates the forced position check.



3.2.2.1.13 Waveform data in a column

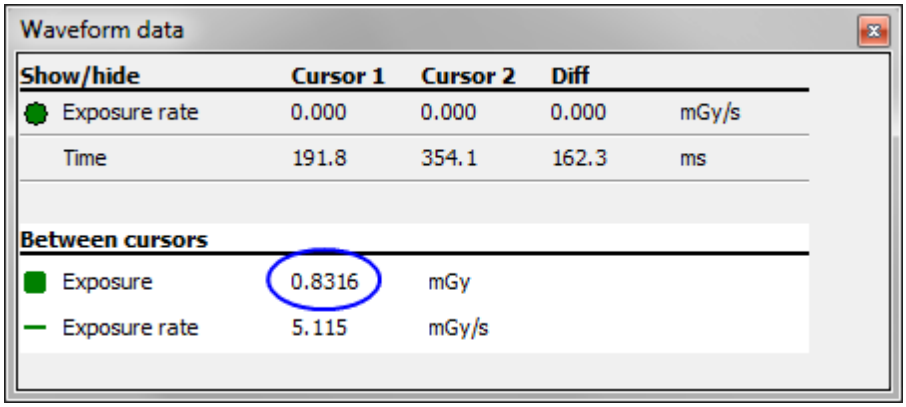
It is possible to get waveform data directly into a column in the grid. This is done by creating a link from the waveform data to a user-defined column in the grid. Assume that you have the following measurement:

View / Select	#	Exposure (mGy)	Exposure rate (mGy/s)	Exposure time (ms)
	1	2.392	4.557	524.9
	2	3.836	7.204	532.5
	3	6.844	12.43	550.5
	4	11.78	21.30	553.0
	5	28.24	52.93	533.5
	6	36.70	65.12	563.6



Click to compress

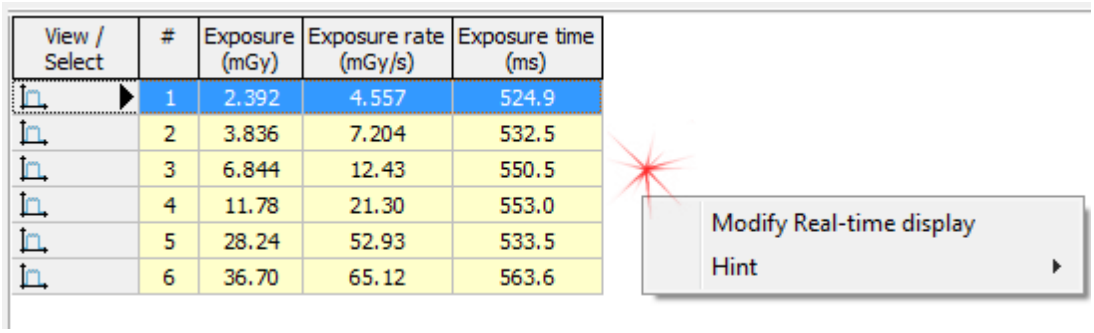
You have measured a pulsed exposure and you want to record the exposure only for the second pulse. This value is available on the waveform data panel if you place the cursors as shown in the picture above.



Click to compress

To show waveform data in a column:

1. Right-click outside the grid and select "Modify real-time display" (or "Modify test" if it is a test you are working with).

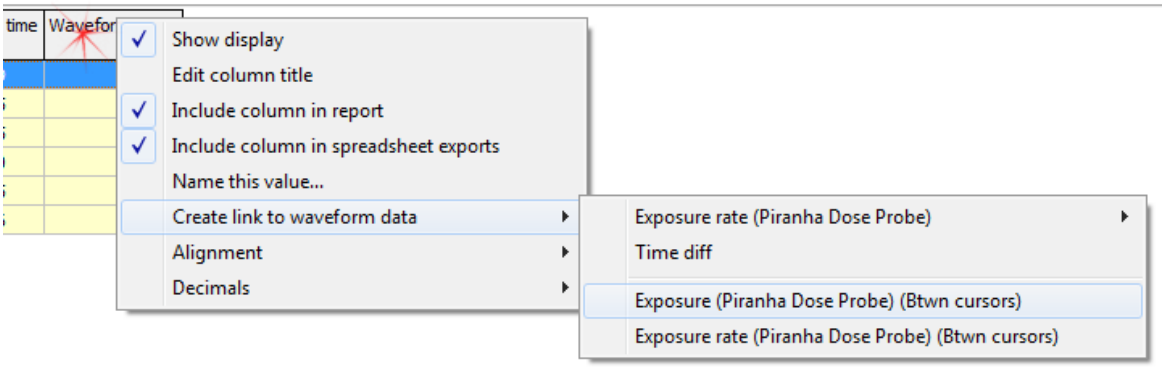


Click to compress

2. A wizard is shown and a list of all columns are shown. Go to the group Other and add the column "Waveform value (Calculated)".

3. Finish the wizard. The new column appear in the grid.

4. Now create a link to show the value from the waveform panel. Right-click on the new column's heading.

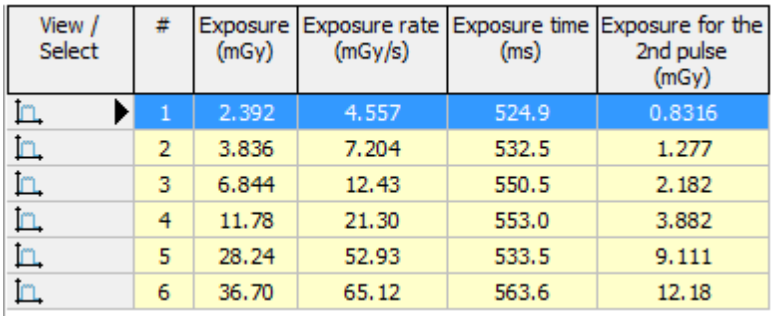


Click to compress

5. Select "Create link to waveform data" and the parameter you want, in this case the exposure between the cursors.

6. The link is created (if the test or real-time display has data already all cells are updated according to current cursor position).

7. You may want to change the column title. Right-click on the column heading and select "Edit column title".



Click to compress

3.2.2.1.14 Add/delete column or general settings

This topic deals with adding or deleting columns or general settings.

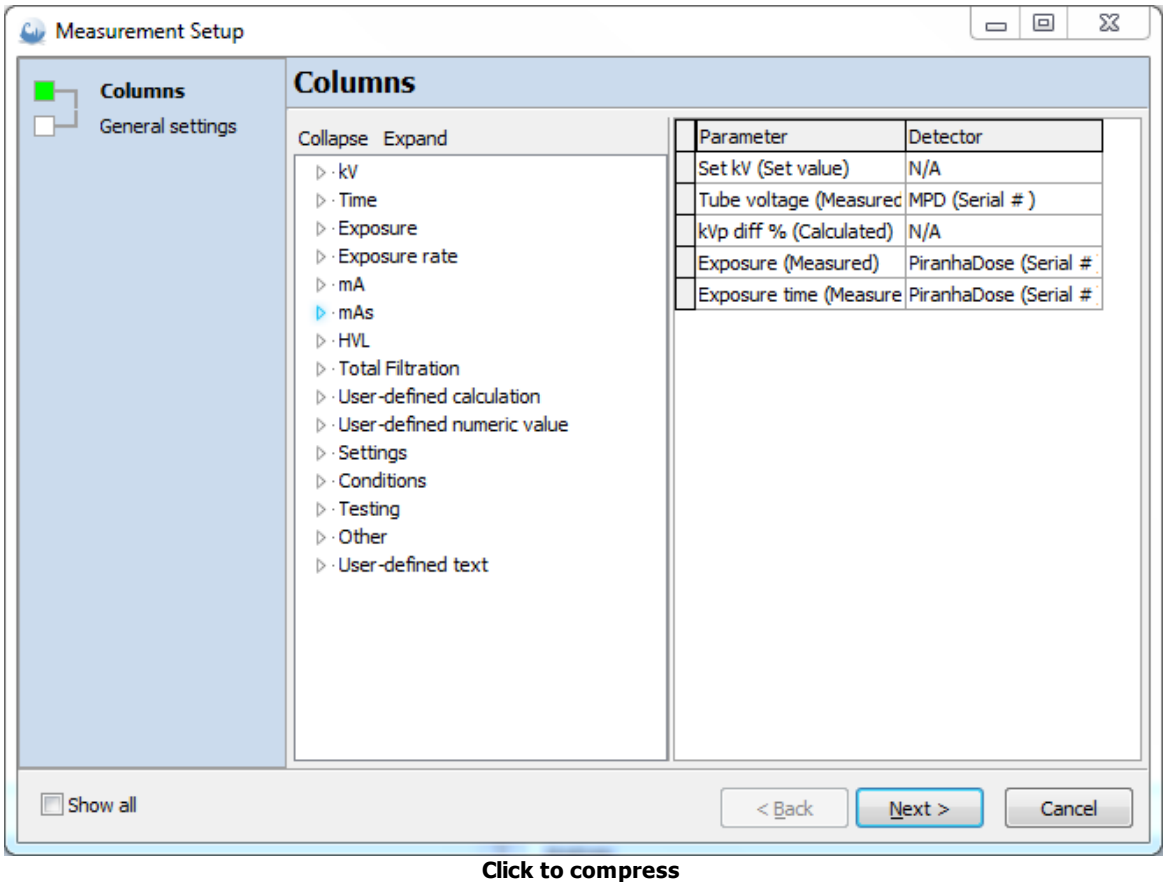
Let's assume we have the following template and we want first to change some columns around by adding some and deleting others. We would do it following the steps below:

Set mAs (mAs)	SDD (cm)	Set time (ms)
5	70	100

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)
	1	60	60,62	1,0	0,3330	98,27
	2	70	69,77	-0,3	0,4390	98,77
	3	80	80,88	1,1	0,5885	98,77
	4	90	90,37	0,4	0,7168	98,77
	5	100	100,89	0,9	0,8833	98,78
	6	110	109,57	-0,4	1,022	98,78
	7	120	120,43	0,4	1,195	98,77

1. Right-click outside the grid on the empty space to the right or below the grid and select Modify Test. You can also go to the Design page on the ribbon bar and select Modify from the Test/Checklist group to achieve the same result.

2. The modify test wizard will start to guide you through the process. The first page of the wizard looks like the picture below.



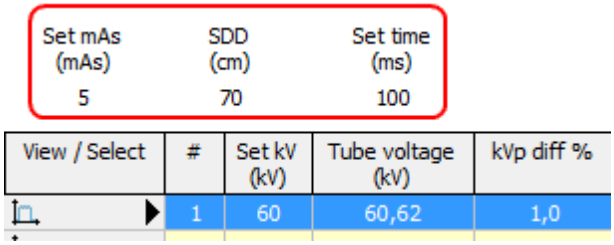
Click to compress

To add a column: Use drag-and-drop to select a column from the left side and drop it to the right side. You can also double-click on columns on the left side to select them. The columns on the right side will be the ones in your template.

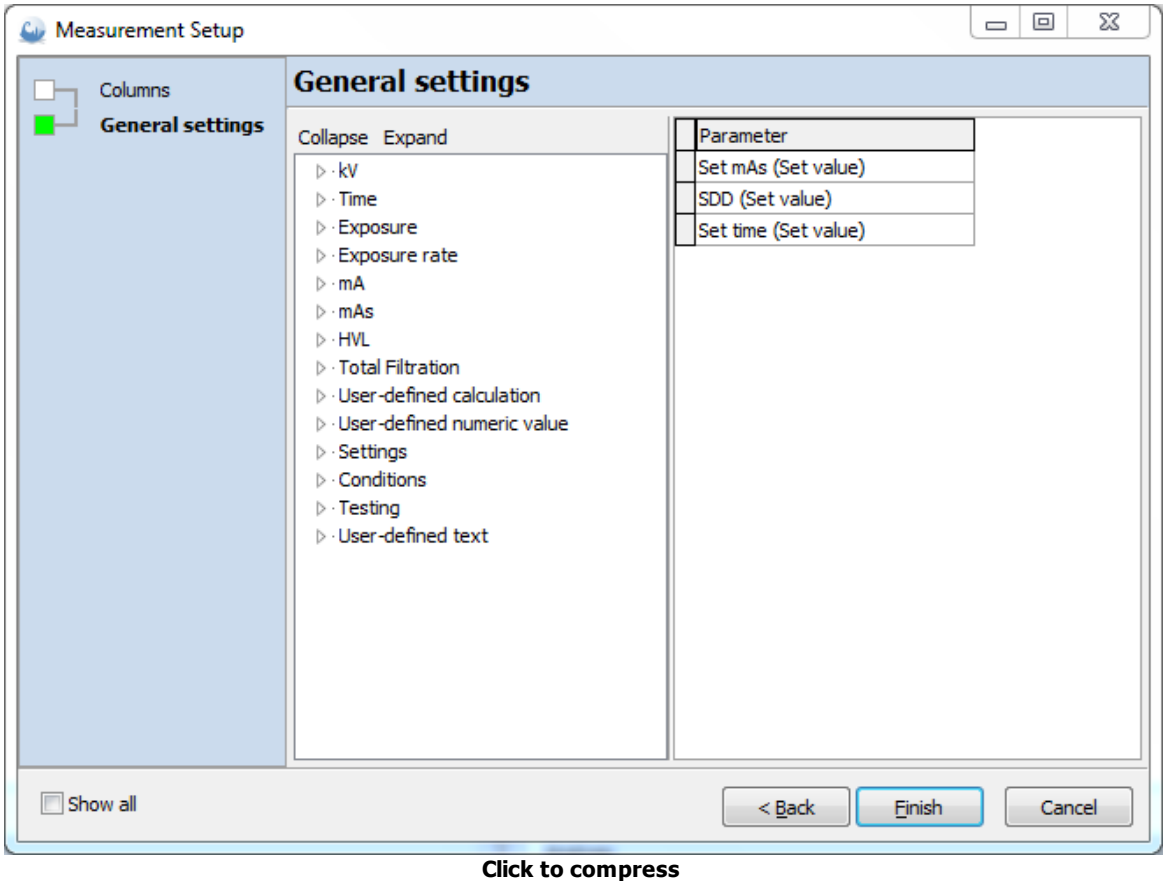
To delete a column: Right-click on a column on the right side and select Delete from the drop-down menu, or select a column on the right side and then use the Delete key on your keyboard.

3. When you are finished, click Next to continue with the wizard.

4. Now you can change the General settings:



The next page of the wizard will look very much like the one above, but it will contain general setting items instead of columns.



Click to compress

The add and remove general setting items procedure is the same as the one we described above to add and delete columns.

5. Click Finish when you are ready and the wizard will end. As soon as the wizard ends, the changes we made are visible in the test template.

There are other changes you can make to the order of columns and items in the general settings, as well as change the width of columns and modify set values.

3.2.2.1.15 Add ananlysis

If you want any kind of evaluation of your measured data, at least one (or more) analysis must be assigned to your test template. This topic will describe how you assign an analysis to your test.

The following is a list of analyses available in Ocean:

Accuracy	Evaluates the accuracy of all measured parameters. It calculates the deviation between a measured value and a set value (reference value) and compares against specified pass/fail criteria.
Reproducibility	Evaluates the reproducibility of all measured parameters. It calculates the difference from mean value, coefficient of variation and standard deviation.
mA linearity	Evaluates the mA linearity. It compares the mA/expsure value of the different mA stations. It can be used with mA/time and mAs generators.
HVL	Calculates half-value layer based on a number of exposures with increasing added filtration. Calculated half-value layer is compared to specified pass/fail criteria.
QuickHVL	Compares the direct measured half-value layer to specified pass/fail criteria.
CTDI	Calculates CTDI based on five CT dose values measured in different positions in a CT phantom. It calculates CTDI, weighted CTDI and normalized CTDI.
AGD(ACR)	Calculates the average glandular dose according to the rules specified by *ACR, Mammography Quality Manual, 1999, ISBN 1-55903-142-5.* Required input is an HVL value, an entrance kerma dose value and the target/filter used.
AGD(EUREF)	Calculates the average glandular dose according to the rules specified by *European Protocol for the Quality Control of the Physical and Technical Aspects of Mammography Screening, Appendices, page 110, 2005.* Required input is an HVL value, an entrance kerma dose value, the target/filter used and phantom thickness.
AGD(IAEA)	Calculates the average glandular dose according to the rules specified by *IAEA, Technical Reports Series no 457, Dosimetry in Diagnostic Radiology: An International code of Practice, page 155-163, 2007, ISSN 0074-1914; no 457.* Required input is an HVL value, an entrance kerma dose value and the target/filter used.
Min/Max	Compares specified parameter to a high and/or low accepted limit. It can be used with all measured parameters and the user-calculation column.
Checklist	Presents the result of a checklist, if it passed or failed, how many fails and how many warnings there were.
AEC	Evaluates the mA linearity. There are five different analysis to analyse; kV compensation, mA compensation, reproducibility, reciprocity, field balance and density correction.

If you want to see a detailed specification of an analysis, click on the analysis name above.

Let's assume we have the following template and we want to evaluate the kV accuracy. To do this, we must add the accuracy analysis to each row we want to evaluate.

Set time (ms)	Set mAs (mAs)
100	10

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
▶	1	40				
	2	60				
	3	80				
	4	100				
	5	120				
	6	140				

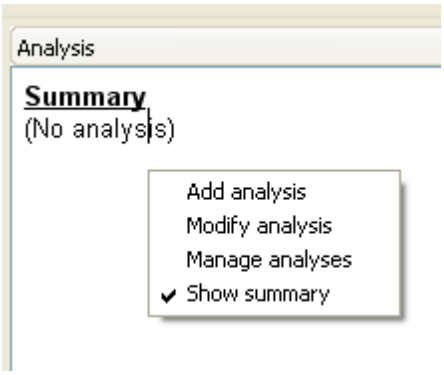
To add the accuracy analysis, we'll follow the steps below:

1. We'll select the rows you we want to include in the analysis. In this example, we'll use all rows in the analysis.

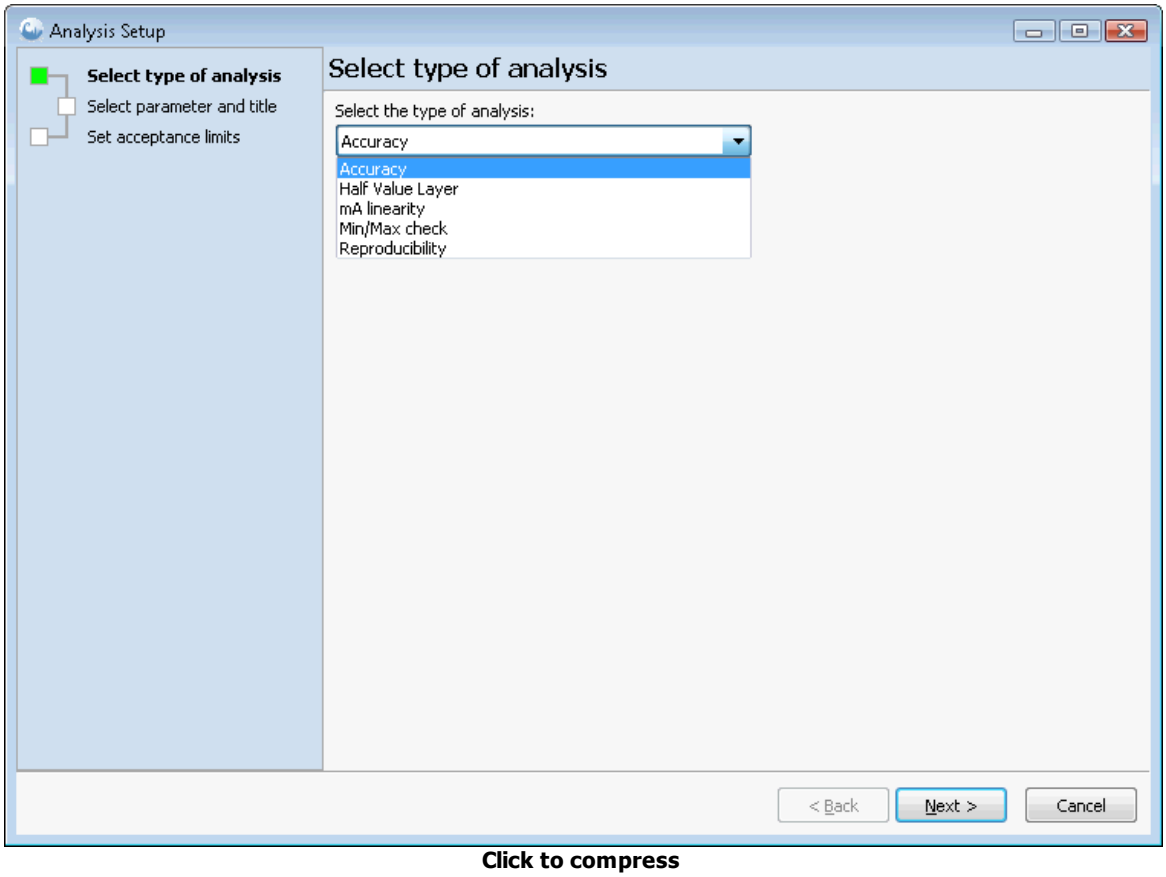
View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
	1	40				
	2	60				
	3	80				
	4	100				
	5	120				
▶	6	140				

HINT: If you want all rows in the analysis, you don't actually need to select as shown, because by default, if one row is selected, all rows will be included anyway.

2. Next, we'll go to the Design page on the ribbon bar and click the Setup analysis  button (another way to do this is to right-click in the Analysis window to get the same result).



3. From the drop-down menu select Add analysis, and the analysis setup wizard will start to guide us through the process.

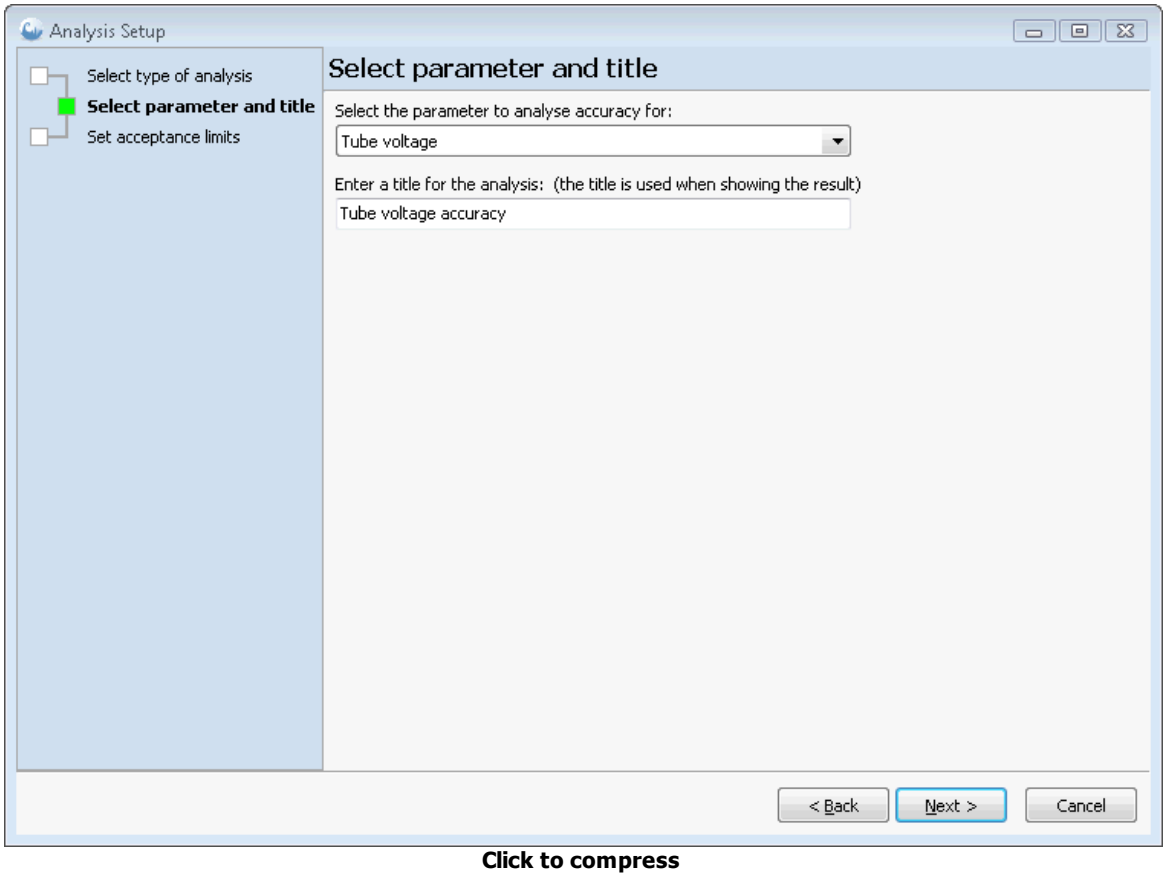


Click to compress

NOTE: If Accuracy is not shown, one or several columns needed for that analysis are missing. You can read the Accuracy topic if you want to know which columns are required by this analysis.

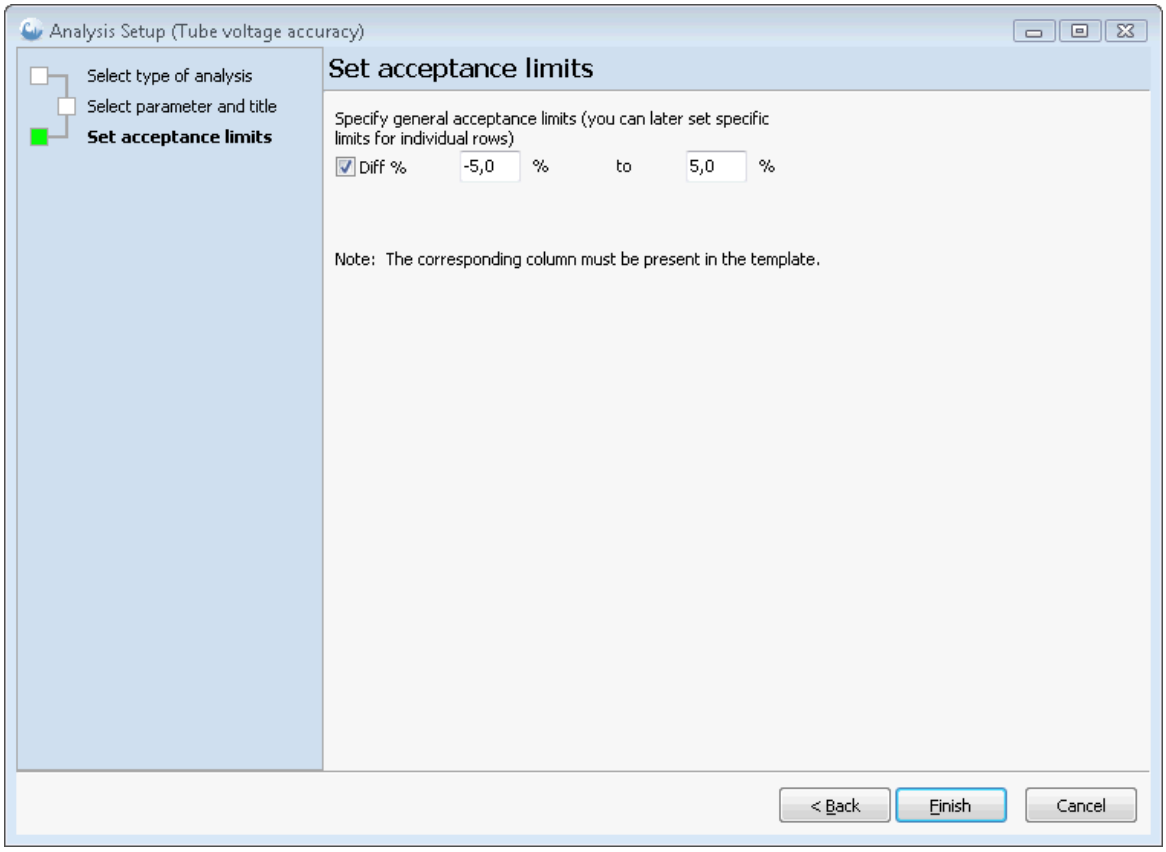
For our example, we'll select Accuracy from the list and click Next to continue with the wizard.

4. The next window is where we can select a title and parameter for our analysis. Select "Tube voltage" as the parameter, and keep the title as the default Ocean suggests then click Next to continue with the wizard. (The picture below shows the second page of the analysis setup wizard)


Analysis Setup
Select type of analysis
Select parameter and title
Set acceptance limits
Select parameter and title
Select the parameter to analyse accuracy for:
Tube voltage
Enter a title for the analysis: (the title is used when showing the result)
Tube voltage accuracy
< Back
Next >
Cancel

Click to compress

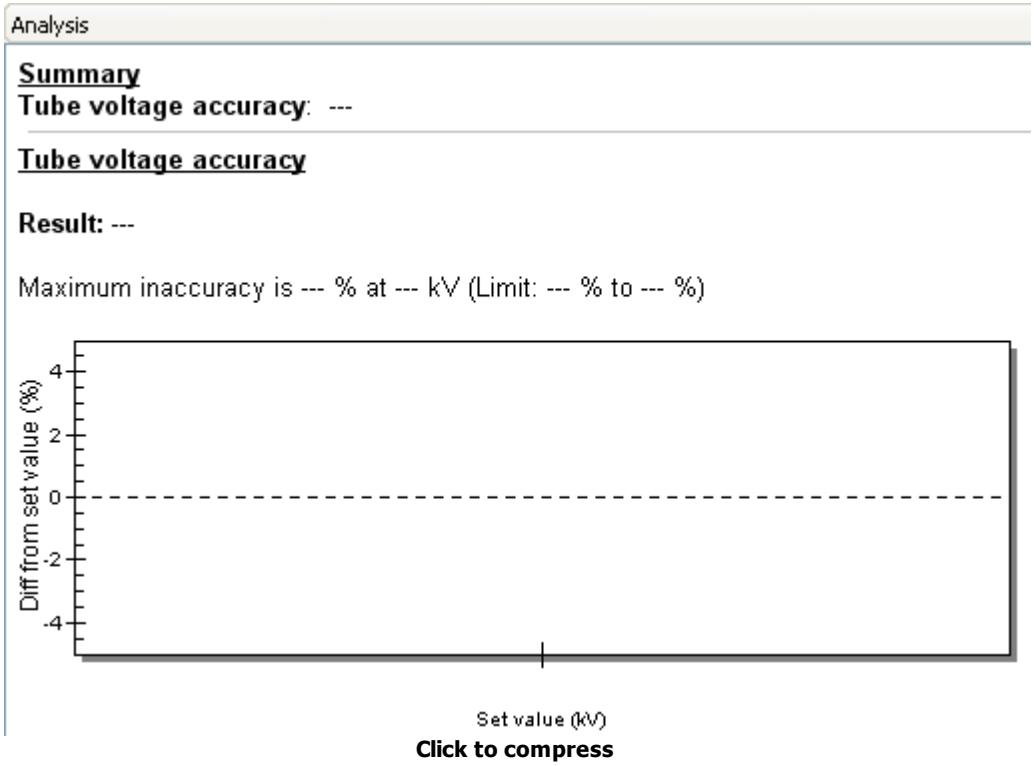
5. The last page of the wizard is where where we'll specify the acceptance limits for our new Accuracy analysis, and the it looks like the picture below.



Click to compress

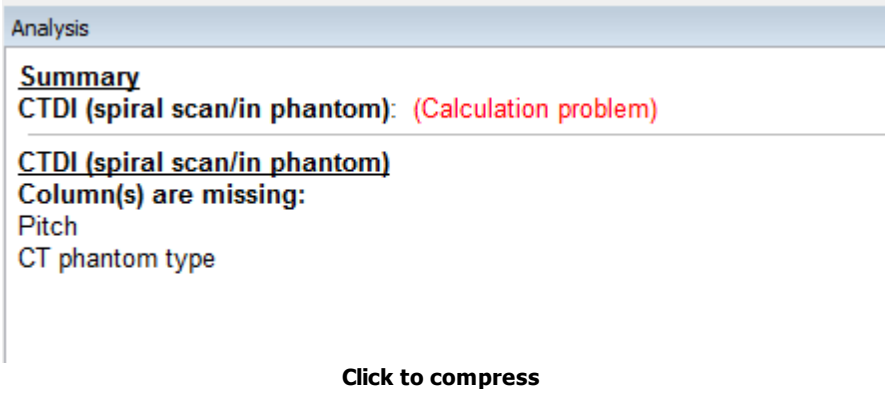
As you can see, the wizard already comes with default limits most commonly used for this parameter, but this can be changed if you prefer a different pass/fail criteria. These default acceptance limits Ocean suggests are assigned to all rows included in the analysis, so if you want something different for some of the rows in your template, you'll have to modify those rows. This is described in more detail in the Modify analysis topic.

6. For our example, we'll choose to leave the default acceptance limits suggested by Ocean and click Finish to end the wizard. Once the wizard ended, we'll be able to see the new analysis in the analysis window. It will look like the following picture.



Click to compress

If columns are missing to do the analysis this is shown in the analysis window in the following way:



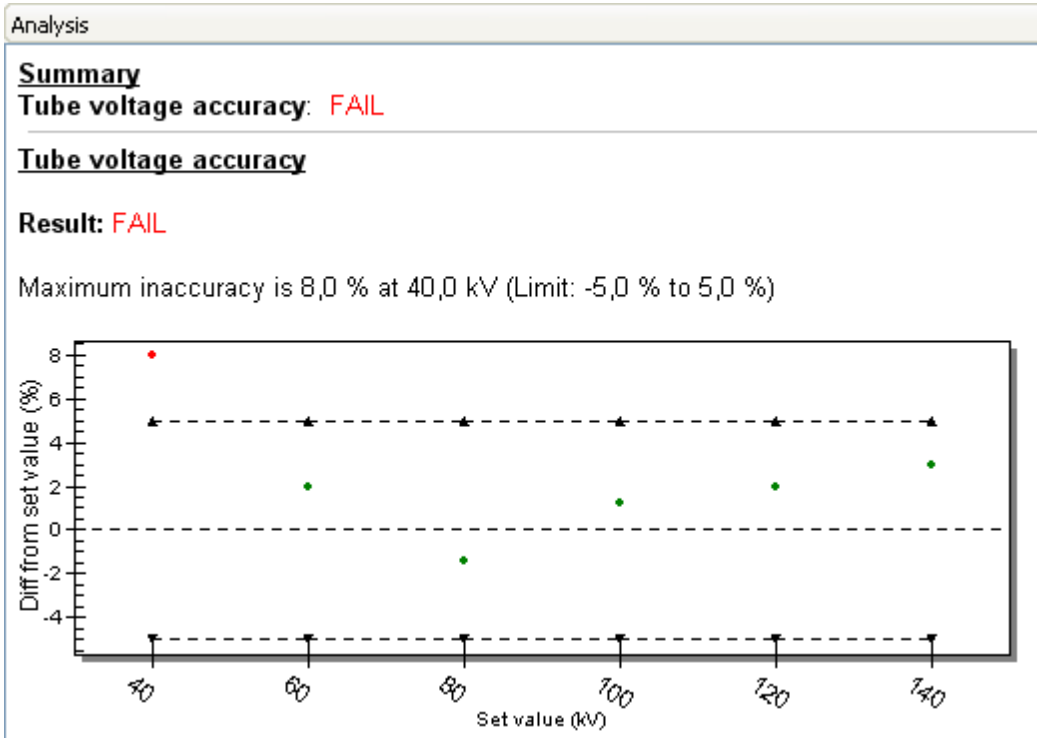
Click to compress

Missing columns are listed and no calculation can be done until they have been added to the test.

NOTE: Since this is a template, there will be no values in the analysis yet, as there are no measurements to analyze. When you use the template and make some exposures, the analysis results will look like this.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
▶	1	40	43,2	8,0		
	2	60	61,2	2,0		
	3	80	78,9	-1,4		
	4	100	101,2	1,2		
	5	120	122,3	1,9		
	6	140	144,2	3,0		

You can now see calculated values in the "kVp diff %" column and results in the analysis window (shown below).



Click to compress

The last thing to do is to save our work, and we are finished with our new template.

There are a wide range of possibilities to build templates and when you do your own, you may want to add more than one analysis to a template and customize it according to your liking. The above was a basic example to get you started. Other relevant topics are listed below:

Change acceptance limits, include/exclude rows - read the Modify topic.
Change the title or the result text appearance (defaults are "Pass" and "FAIL") or change the layout of how the analysis result is presented - read the Advanced analysis topic.

3.2.2.1.16 Modify analysis

This topic covers the most common modifications you would want to do to your analysis. These are:

- include/exclude rows from the analysis and
- change the acceptance limit of each row.

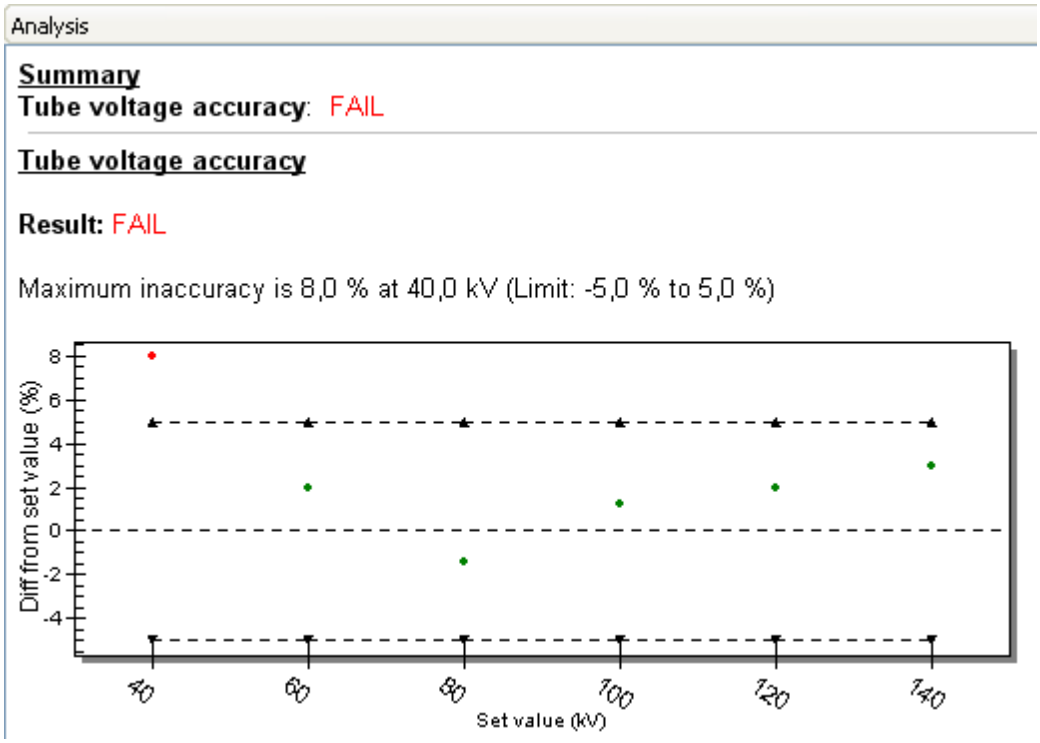
The Advanced analysis topic covers the more advanced analysis customization options.

Let's assume we have a template like the picture below.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
▶	1	40	43,2	8,0		
	2	60	61,2	2,0		
	3	80	78,9	-1,4		
	4	100	101,2	1,2		
	5	120	122,3	1,9		
	6	140	144,2	3,0		

NOTE: The above is a template that has already been used, as it contains measurements and analysis calculations. A test template is normally empty (contains no measurements or analysis calculations).

The picture below shows the details of what the accuracy analysis looks like with the default settings. Let's make some changes to this to make it more like what we want.



Click to compress

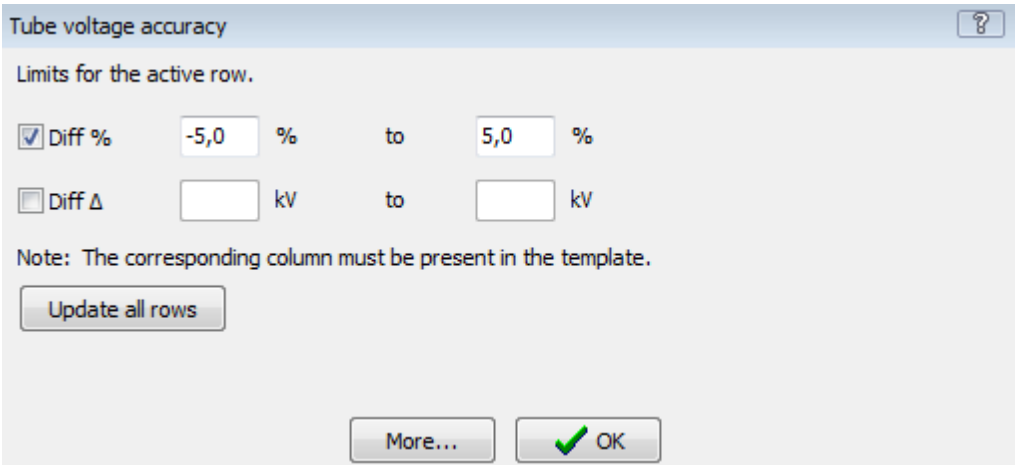
1. Go to the Design page on the ribbon and click on Setup analysis.

2. Select "Tube voltage accuracy" (or your own title if you didn't use the default one when you added the analysis). You can also right-click on the Analysis window and select modify from the menu. When we clicked on the analysis setup function, you will notice two things happen:

- The first is that the grid is grayed out and a new column is to the left of the "View/Select" column with checkboxes in front of each row, all checked. The rows that have a checkbox "checked" are included in the analysis. As you can see they are all checked, as the default is to include all rows in the analysis. To exclude a row, just uncheck the corresponding checkbox.

	View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
☑	▶	1	40	43,2	8,0		
☑		2	60	61,2	2,0		
☑		3	80	78,9	-1,4		
☑		4	100	101,2	1,2		
☑		5	120	122,3	1,9		
☑		6	140	144,2	3,0		

- The second is that at the bottom right of your screen, the analysis window is now showing the acceptance limits window. This is where we can modify the acceptance limits for individual rows, or for all rows. It is possible to have a different acceptance limit for each row in a template.



Click to compress

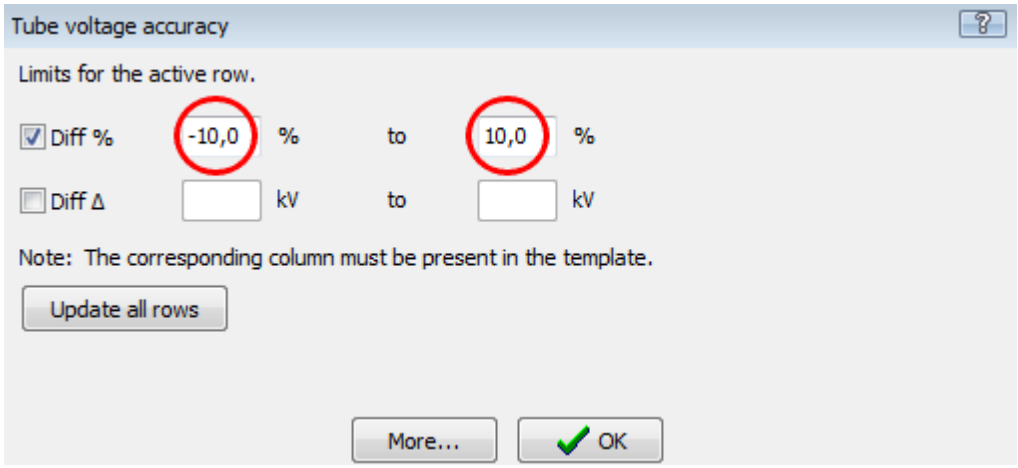
The button "Update all rows" will set the same value for all of the rows in the template.

In the example below, we'll change the acceptance limit of several rows in the template below. Let's assume that we want to change the acceptance limit from +/- 5 % to +/- 10 % for rows 1, 2 and 5. To do this, follow the steps below:

1. Use multi-row select to choose rows 1, 2 and 5 (click in the "View/Select" column of the first row to select it, then hold down the Ctrl-key and click on row 2 and 5).

	View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
☑		1	40	43,2	8,0		
☑		2	60	61,2	2,0		
☑		3	80	78,9	-1,4		
☑		4	100	101,2	1,2		
☑	▶	5	120	122,3	1,9		
☑		6	140	144,2	3,0		

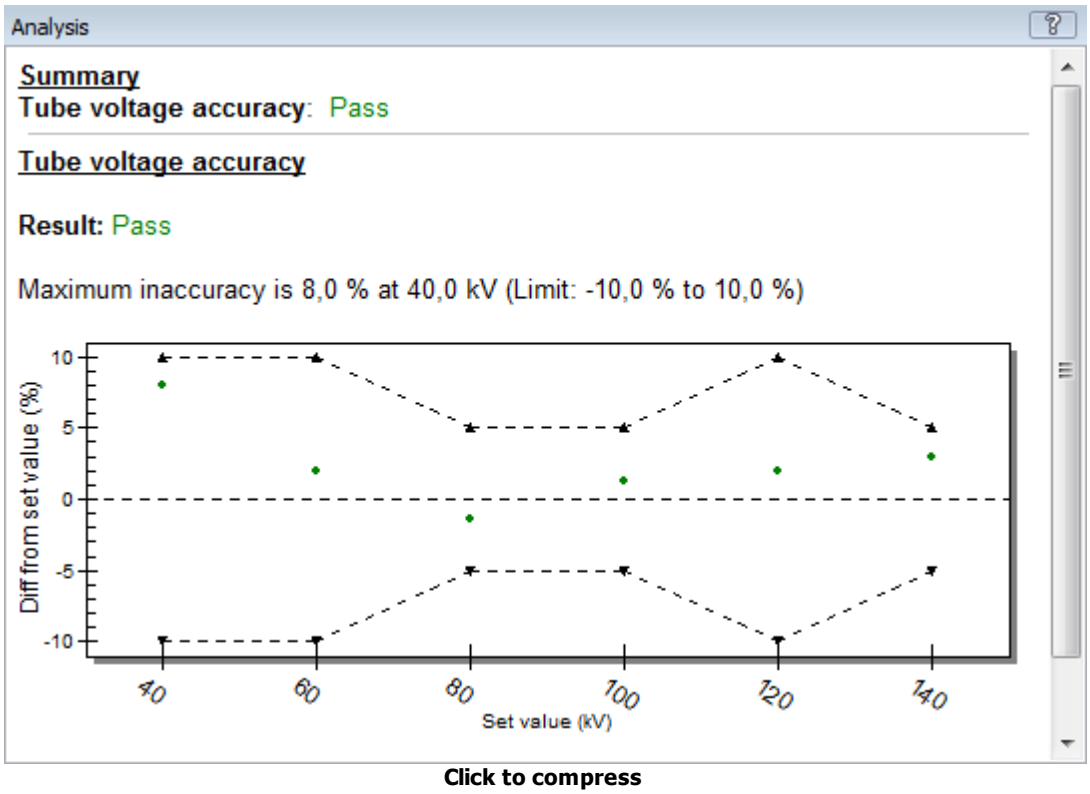
2. Next, we'll go to the analysis window (bottom right of the screen) where you can see the current acceptance limits displayed. Let's change the acceptance limit from +/- 5 % to +/- 10 %.



Click to compress

3. The selected rows now have the new acceptance limits (you can verify this by stepping through the rows in the template). Click OK to end the wizard.

Once the analysis setup wizard is closed, the grid returns to its normal state, reflecting the changes we just finished making.



Click to compress

As you can see in the graph above, the acceptance limits are now changed and the new limits you entered are indicated.

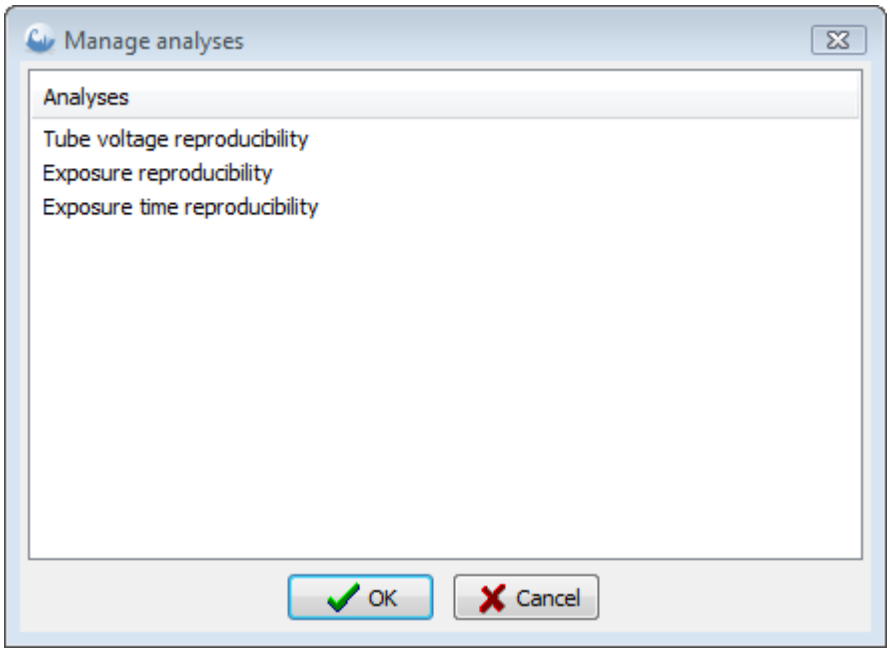
To see how you further can modify the analysis read the Advanced analysis topic.

3.2.2.1.17 Change order of analysis

This topic deals with changing the order of the analysis in a test or checklist template:

1. Right-click on the Analysis window and select "Manage analysis" (or go to the ribbon bar and click the Analysis Setup button and select Manage analysis).

2. A window like the one below will pop up listing all the included analyses (in our example, there are three of them):



Click to compress

3. Click on the analysis whose position you want to change and just drag it to the new desired position, then release the mouse and the analysis will be dropped to the new position.

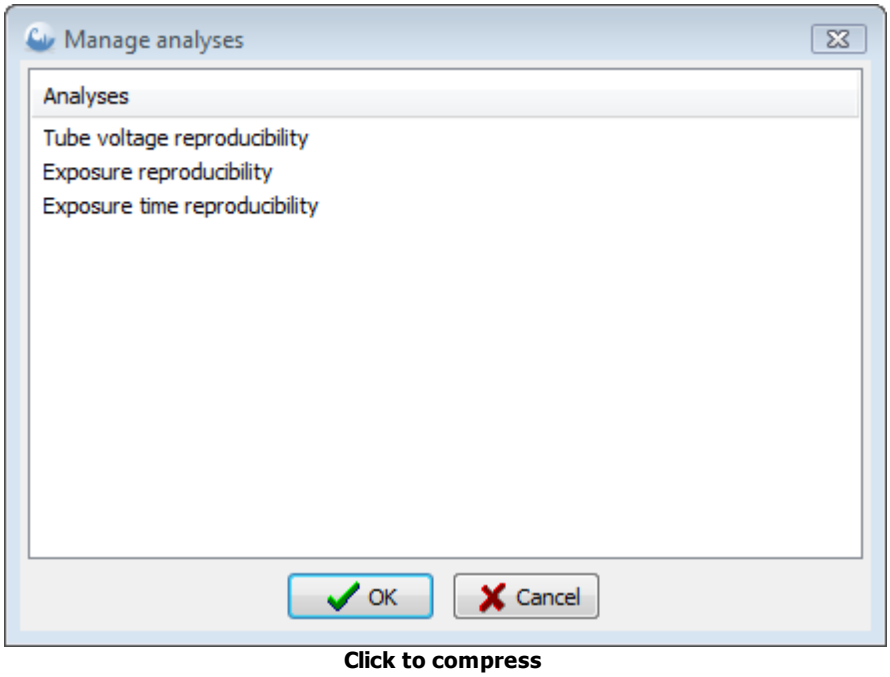
You can also delete an analysis by right-clicking on it and select Delete from the menu.

3.2.2.1.18 Delete analysis

This topic deals with deleting an analysis from a test or checklist template:

1. Right-click on the Analysis window and select "Manage analysis" (or go to the ribbon bar and click the Analysis Setup button and select Manage analysis).

2. A window like the one below will pop up listing all the included analyses (in our example, there are three of them):



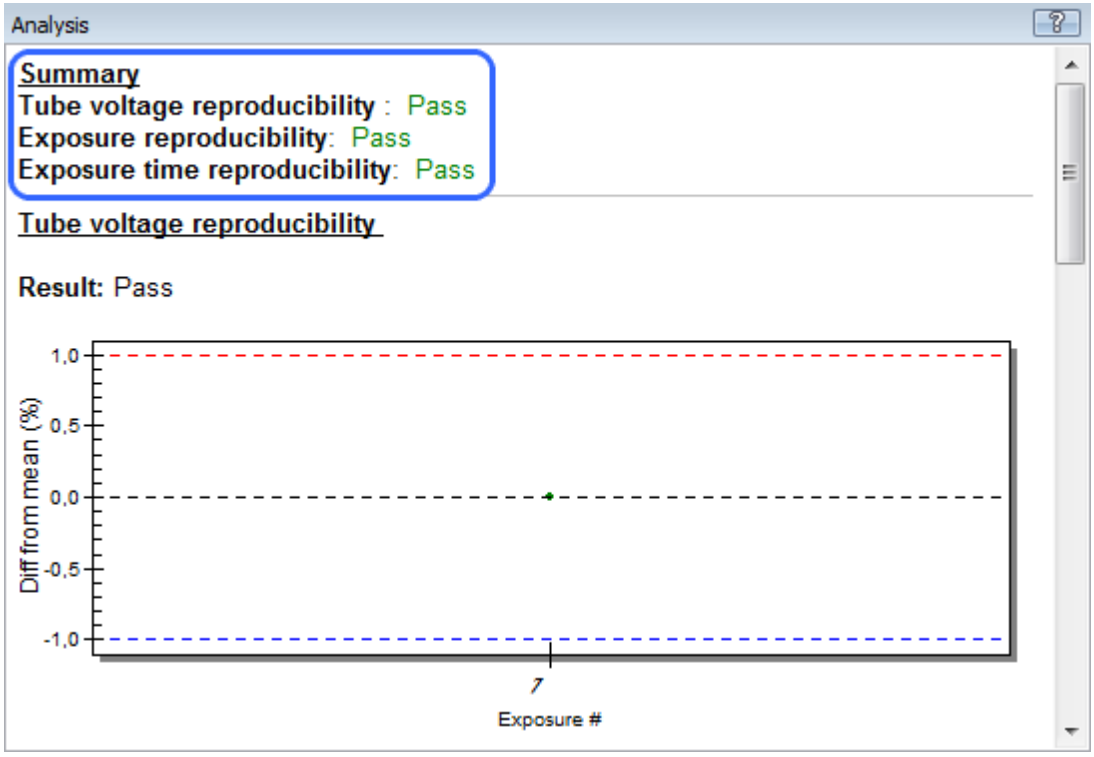
Click to compress

3. Right-click on the analysis you want to remove and select Delete from the menu (you can also select an analysis and press the Delete key on your keyboard).

You can also change order of the analysis by using drag-and-drop.

3.2.2.1.19 Analysis summary

The analysis summary is shown before the detailed analysis results. It lists each analysis title and a pass or fail for each. It gives a quick overview of the total result.



Click to compress

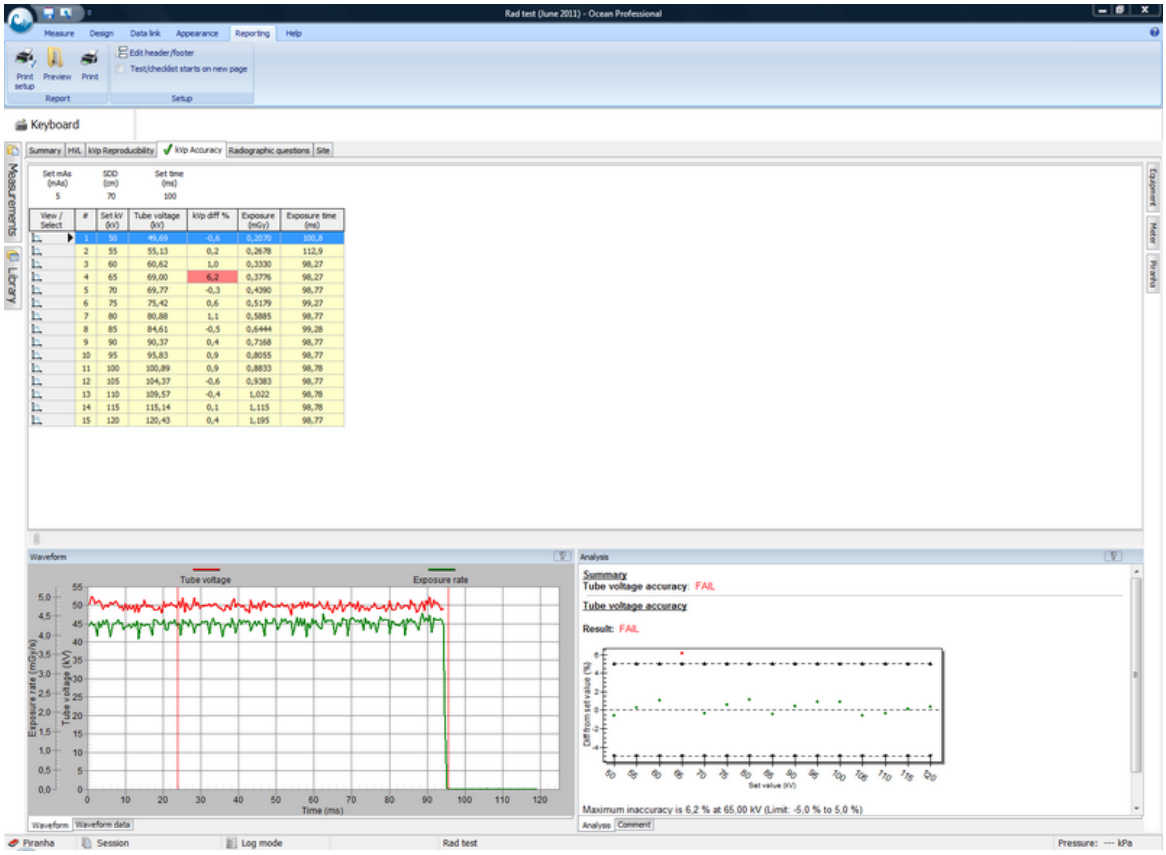
You can hide the summary page if you want by right-clicking on the Analysis window and uncheck the

"Show summary" option. You can do the same thing by going to the ribbon bar and clicking the "Analysis setup" button.

3.2.2.1.20 Add trend analysis

You can include a trend analysis into a test in the same way as you include a test analysis.

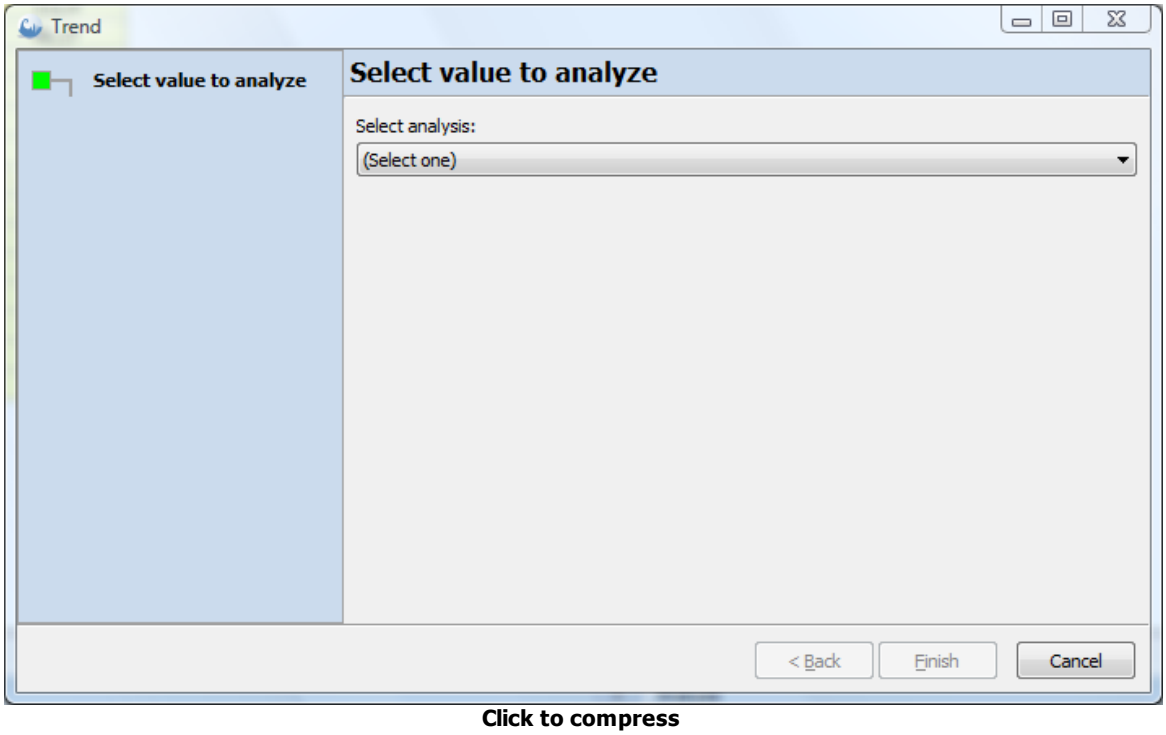
1. Assume that you have the following test:



Click to compress

2. Right-click on the analysis window and select Add trend from the menu (or go to the Design tab on the ribbon bar and click on the Setup button and select "Add trend").

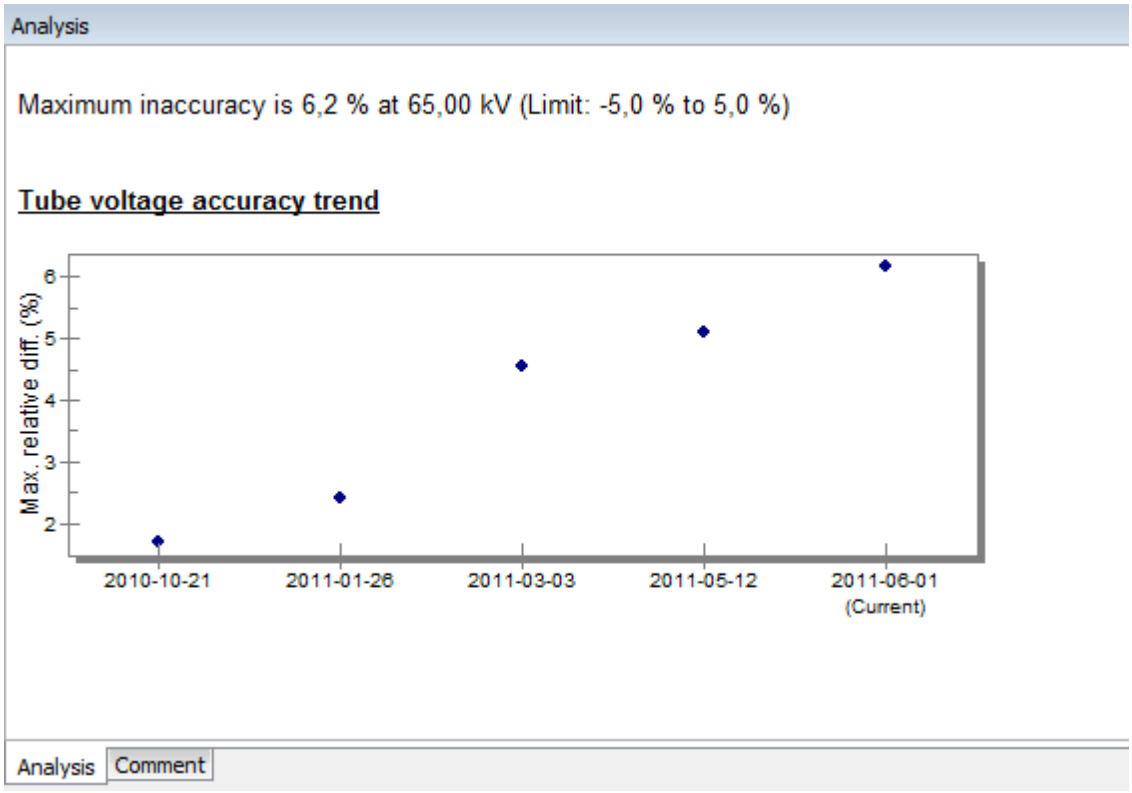
3. A wizard starts that will help you to add the trend analysis.



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4. Select the type of trend you want in the same way as described in topic Trending.

5. The trend analysis is now added to the analysis window (you may have to scroll down to see it).



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6. The trend analysis will also be shown in the printed report.

Note!

The trend analysis is done based on the data that exists in the database. This means that the trend analysis may look different if you export your data and sends it to someone that opens it on another computer.

3.2.2.1.21 Add a user calculation

To add your own calculation you must have the user-defined column "User calc (Calculated)" in your test. This column shows the results of a user-defined formula belonging to this. If you have this column in your test you can use any values present in the grid and your own formula to calculate a value. You can add a user formula to the entire column by clicking on the column heading. You can also add a formula to an individual cell (in the User Calculation column). A formula in a cell has higher overrides a formula that has been assigned to the entire column.

Add a user-defined calculation

All columns has predefined names which you can use in the formulas. You can also give columns/cells your own names. The first example here shows how to calculate the relative output when doing an HVL measurement.

Set mAs (mAs)	Set kV (kV)
2,5	80

View / Select	#	Set Added filtr. (mm Al)	Exposure (mGy)
	1	0,0	0,3006
	2	1,0	0,2341
	3	2,1	0,1847
	4	3,0	0,1588
	5	4,0	0,1276

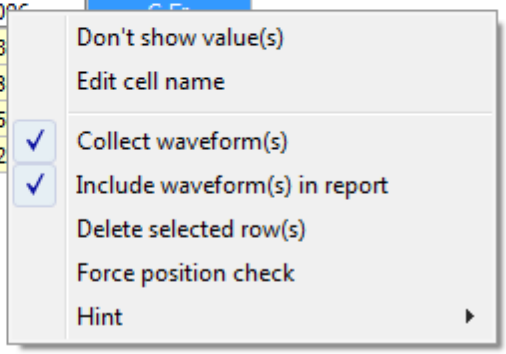
We want now to add a column that shows the relative output when we add filtration.

1. Add the column "User calc (Calculated)".

2. You will need to reference the first exposure value (for 0 mm Al) to do the calculation and you must give this cell a name. Right-click in this cell:

Set mAs (mAs)	Set kV (kV)
2,5	80

View / Select	#	Set Added filtr. (mm Al)	Exposure (mGy)	User calculation
	1	0,0	0,30	
	2	1,0	0,23	
	3	2,1	0,18	
	4	3,0	0,15	
	5	4,0	0,12	



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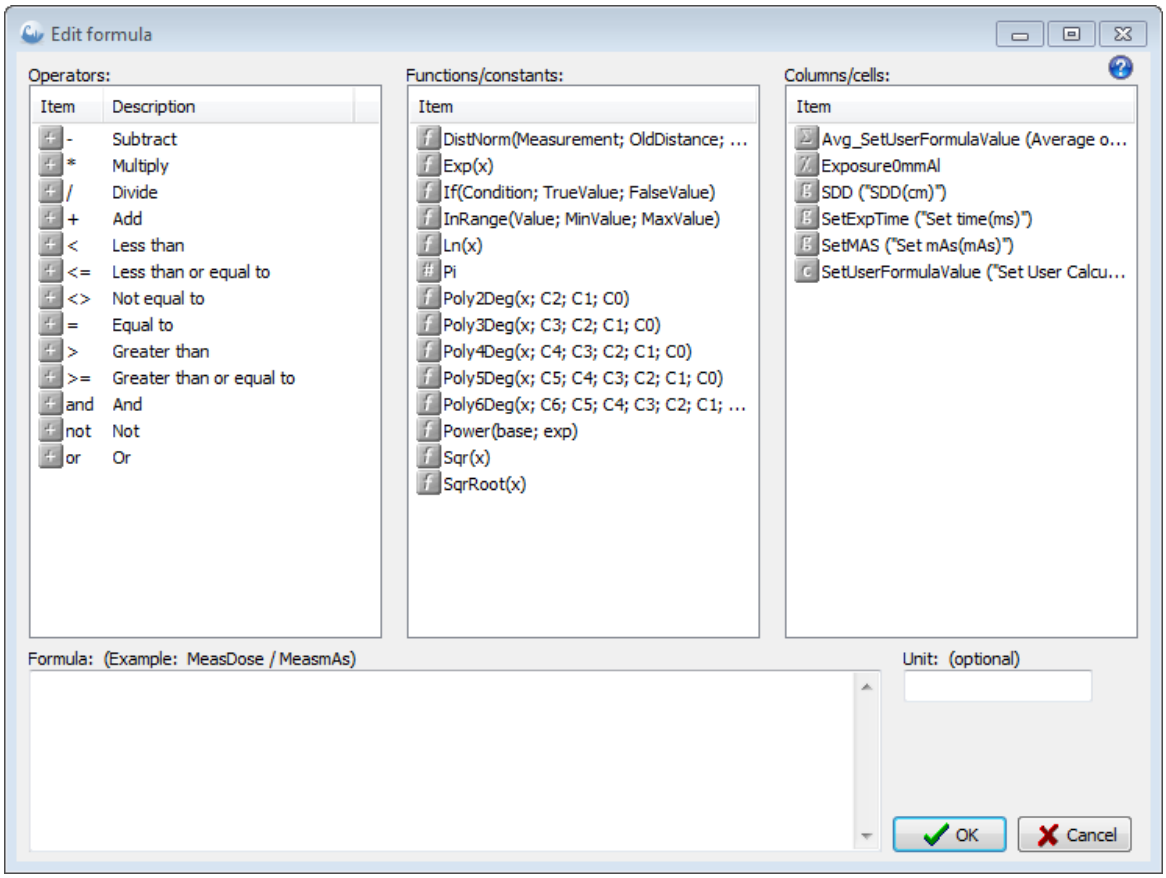
Select "Edit cell name" and name the cell to "Exposure0mmAl".

3. You have now named the cell you want to use and the exposure column has a predefined name you can use. The next step is to enter your formula. The calculation you want to do is:

100*(Exposure0mmAl - Exposure) / Exposure0mmAl.

4. Right click on the "User calculation" column heading and select "Edit formula...". (if you want to add a formula to a cell instead, click on a cell and select "Edit formula...").

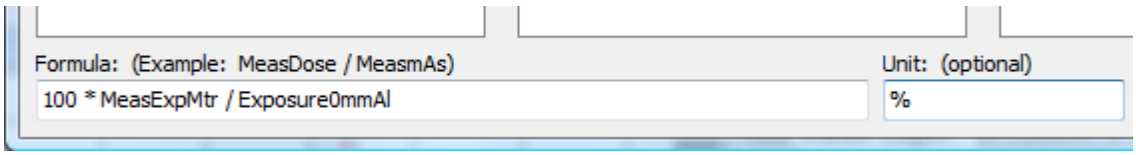
5. A dialogue is shown:



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6. You can now create the formula by clicking on the items. To the left you have operators, middle functions and to the right columns and named cells. Create the formula.

7. You can also specify a unit, in this case "%".



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8. Click OK when you have entered the calculation.

9. The last thing to do is to give the new column a title. Right-click, select "Edit column title" and change to "Rel. exposure".

10. It should now look like this:

Set mAs (mAs)	Set kV (kV)
2,5	80

View / Select	#	Set Added filtr. (mm Al)	Exposure (mGy)	Rel. exposure (%)
	1	0,0	0,3006	100,0
	2	1,0	0,2341	77,9
	3	2,1	0,1847	61,4
	4	3,0	0,1588	52,8
	5	4,0	0,1276	42,4

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You now have a column showing how the exposure is decreasing when you add the Al filters.

Available operations and function

Read the topic User Calculation to get information about all available operations and function.

3.2.2.1.22 Report

There are a few things you can do that will affect on how a test appears in the report. These are:

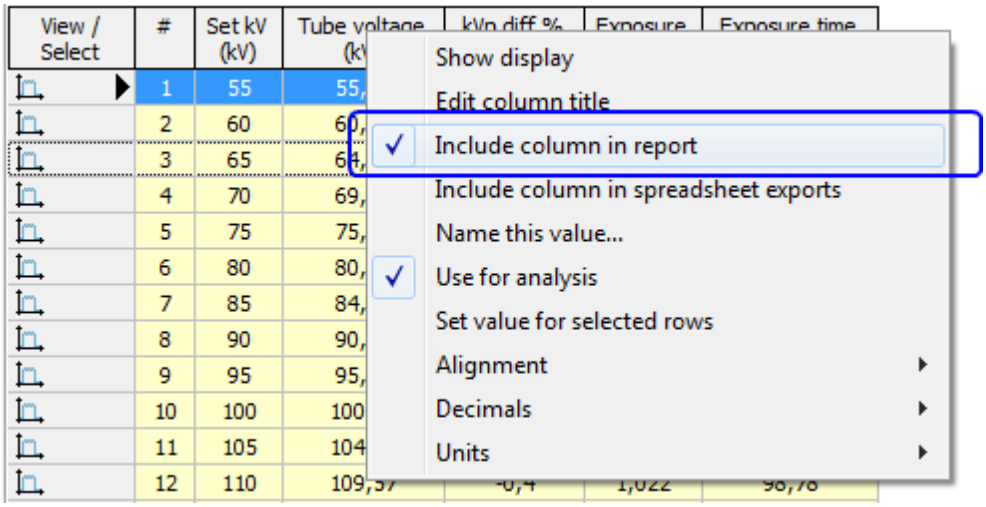
- Exclude columns from the report
- Include waveforms in the report
- Change the width of columns

Exclude columns from the report

All columns will be included in the report by default. You can exclude columns from the report if you like. This is a very useful feature to have, especially if you are having problems fitting all columns on a page. Also there are columns in a template that may not be part of the test, so you may not want to show these columns in a report. An example of this type of column is any column with supporting information for the person who performs the test.

To exclude columns from the report, follow the steps below:

1. Right-click on the column heading, and a drop-down list like the one below will appear.



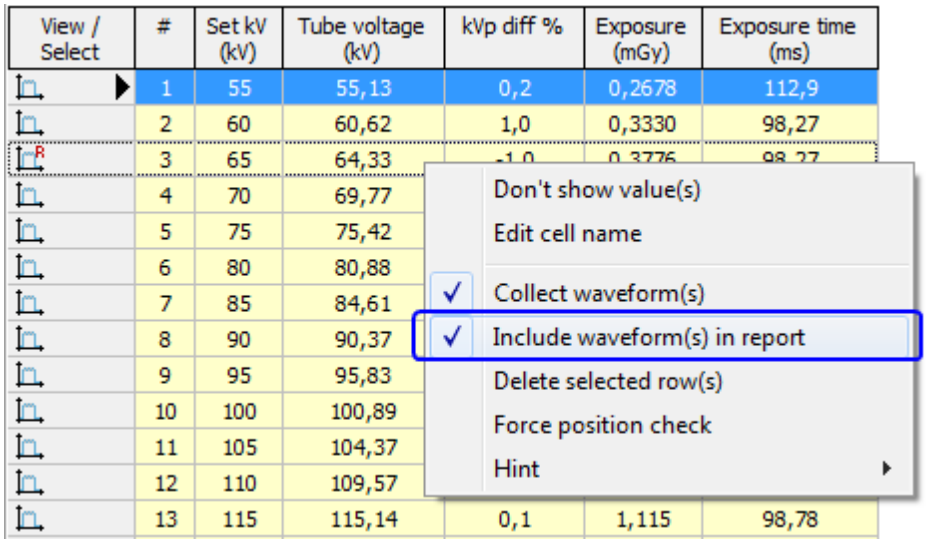
2. Uncheck the "Include column in report" option and that column will be excluded from the report.

Include waveforms

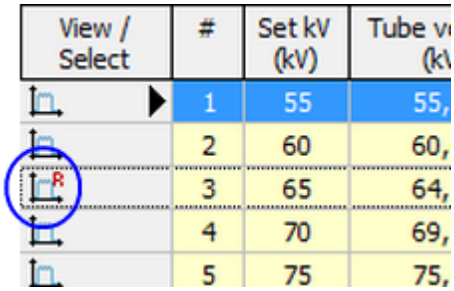
No waveforms are included in the report by default. You can include waveforms using the following steps:

1. Select a row (or use multi-row select to select multiple rows).

2. Right-click on the selected row(s) and a drop-down menu will appear as in the picture below.



3. To include waveforms in the report, check "Include waveform(s) in report" the waveforms in the report. Included waveforms are indicated directly in the grid:



You can also toggle this on and off by clicking on the waveform icon in the grid.

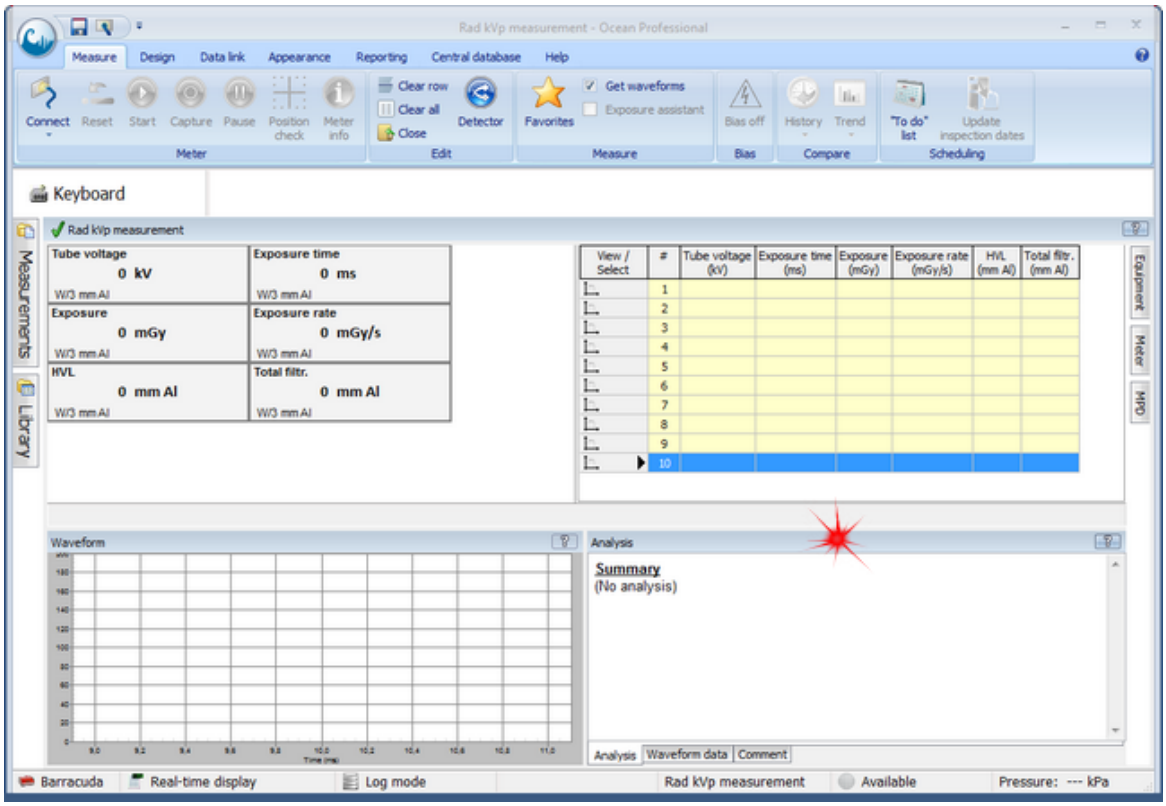
NOTE: If you want waveforms in the report, the "Collect waveform(s)" option must also be checked. This option is always checked by default, as waveforms are always collected when available.

Change the width of columns

The width you give columns on the screen will be saved in the template and used when the test is printed in the report. Just click on any vertical line and drag the line over to the new width desired then release the mouse button and the new width is now set.

3.2.2.1.23 Hide w indow s

When you have created a test template the normal layout of your screen looks like this:

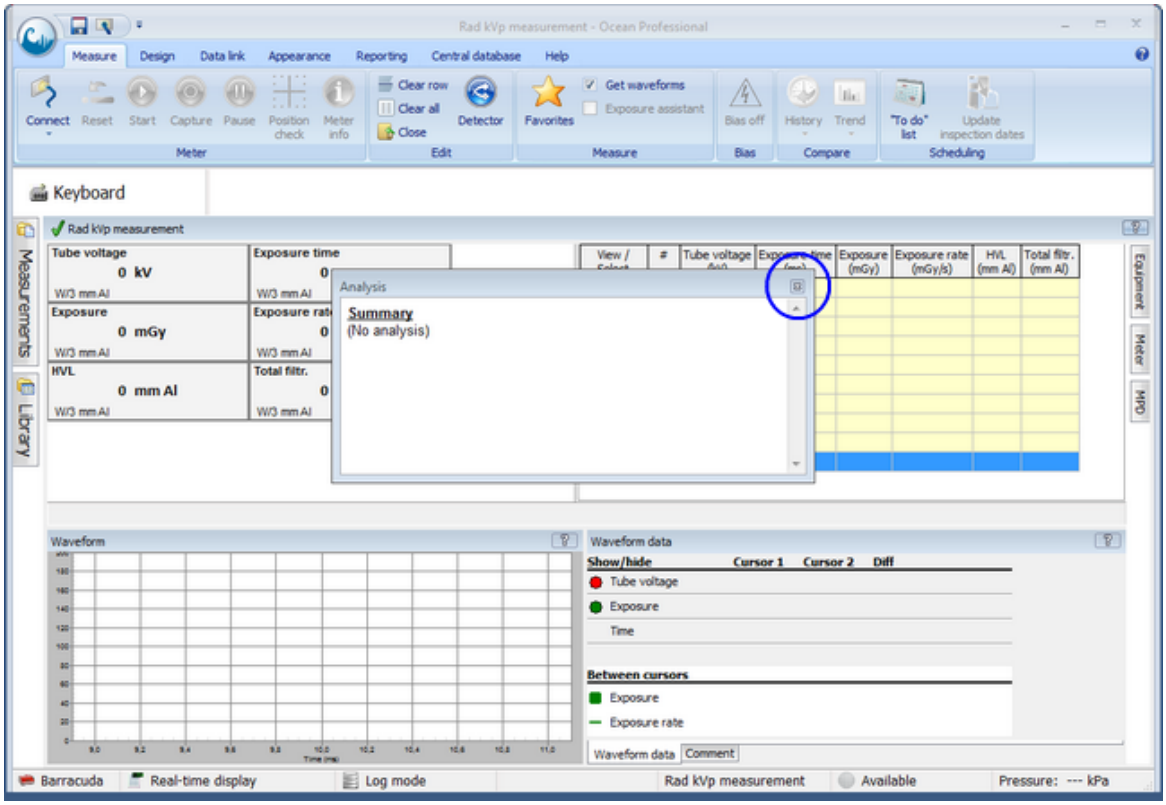


Click to compress

In some situations you may want to hide a window sine you are not using it will simplify the use. Let us assume that you don't want the Anlysis window:

1. Double-click on the caption bar of the Analysis window.

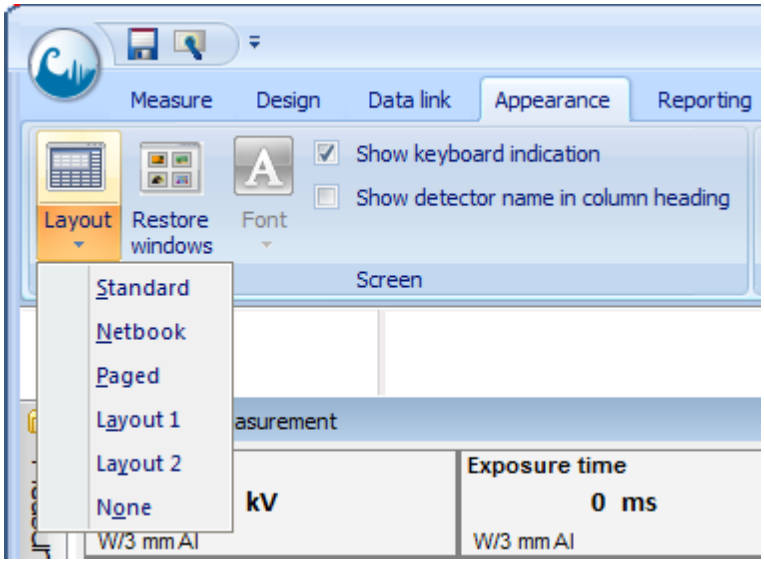
2. The window is undocked.



Click to compress

Click in the upper right corner to hide the Analysis window.

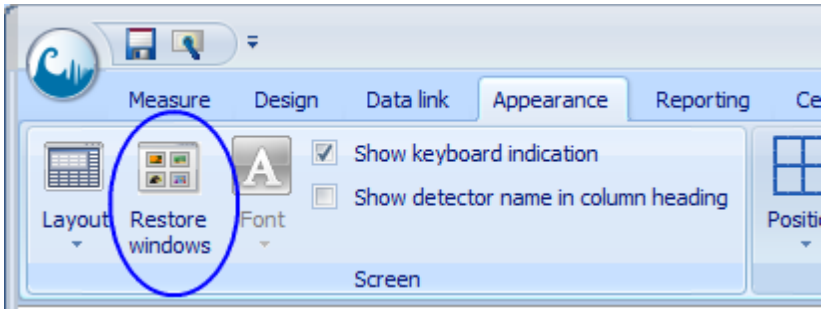
3. Go to the ribbon bar and Appearance. Select the screen layout you want.



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4. Save the template.

If you want to restore hidden windows click on the Restore windows button on the ribbon bar.



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3.2.2.1.24 Advanced analysis

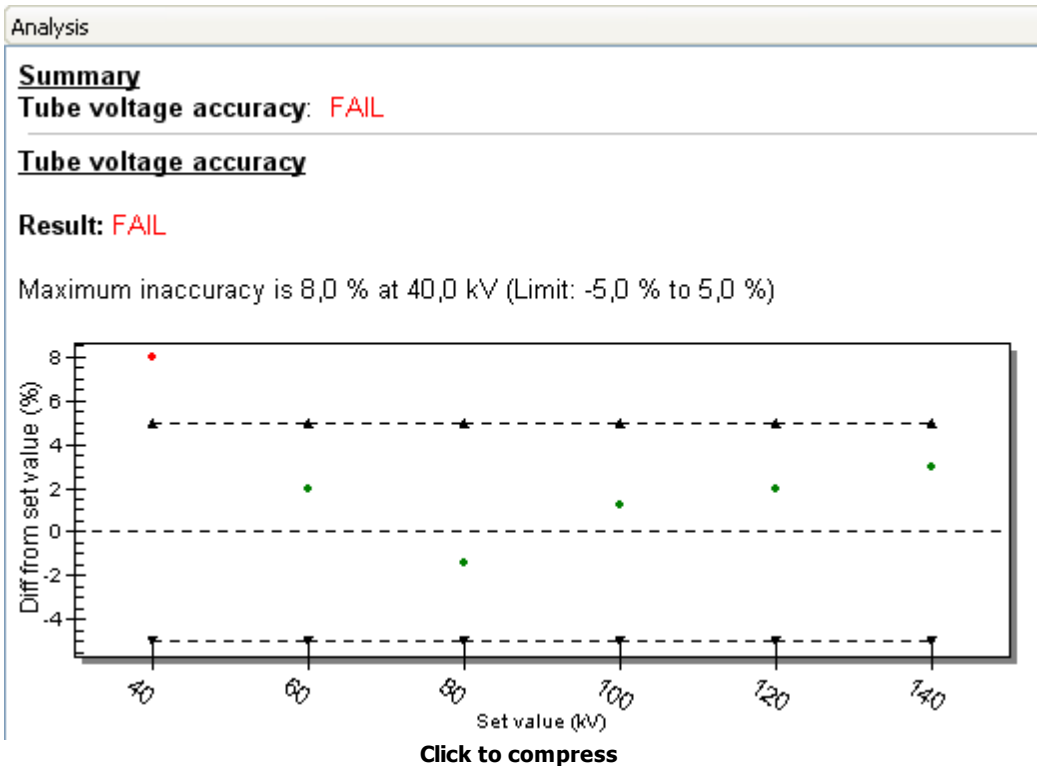
To further customize your analysis you can change the title, the result text (defaults are "Pass" and "FAIL") and the result text layout. We'll show you how to do these customizations in this page.

Let's assume we have a template like the picture below. This is a pretty standard kV measurement template with an accuracy analysis that you would use in your field of work.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
▶	1	40	43,2	8,0		
	2	60	61,2	2,0		
	3	80	78,9	-1,4		
	4	100	101,2	1,2		
	5	120	122,3	1,9		
	6	140	144,2	3,0		

NOTE: The above is a template that has already been used, as it contains measurements and analysis calculations. A test template is normally empty (contains no measurements or analysis calculations).

The picture below shows the details of what the accuracy analysis looks like with the default settings. We are going to use Ocean's advanced analysis customization ability to make this analysis look more like what we want.



Click to compress

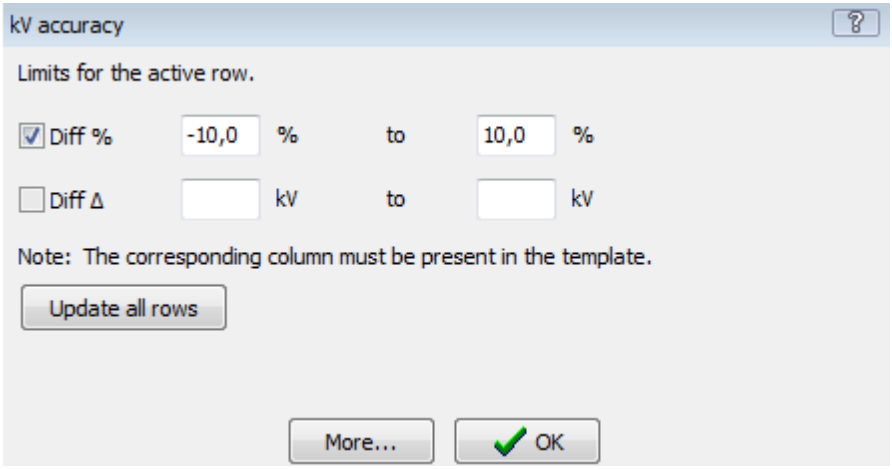
We'll show you how to do the following:

- Change the title to "kV accuracy".
- We will make the title a little bit larger and change the color to a light blue so it stands out more from the rest of the text.
- Change the "pass text" to "Ok" and change "fail text" to "Test failed".
- Add the absolute deviation to the text just above the graph. Our new text will read: "Maximum inaccuracy is X.X % (X.X kV) at XX kV (Limit: -XX % to XX %)" where the red text is new.

If you follow along with our example here, you'll find that Ocean is a lot of fun to use as you can do just about anything you like with it. Let's follow the steps below to customize the analysis layout:

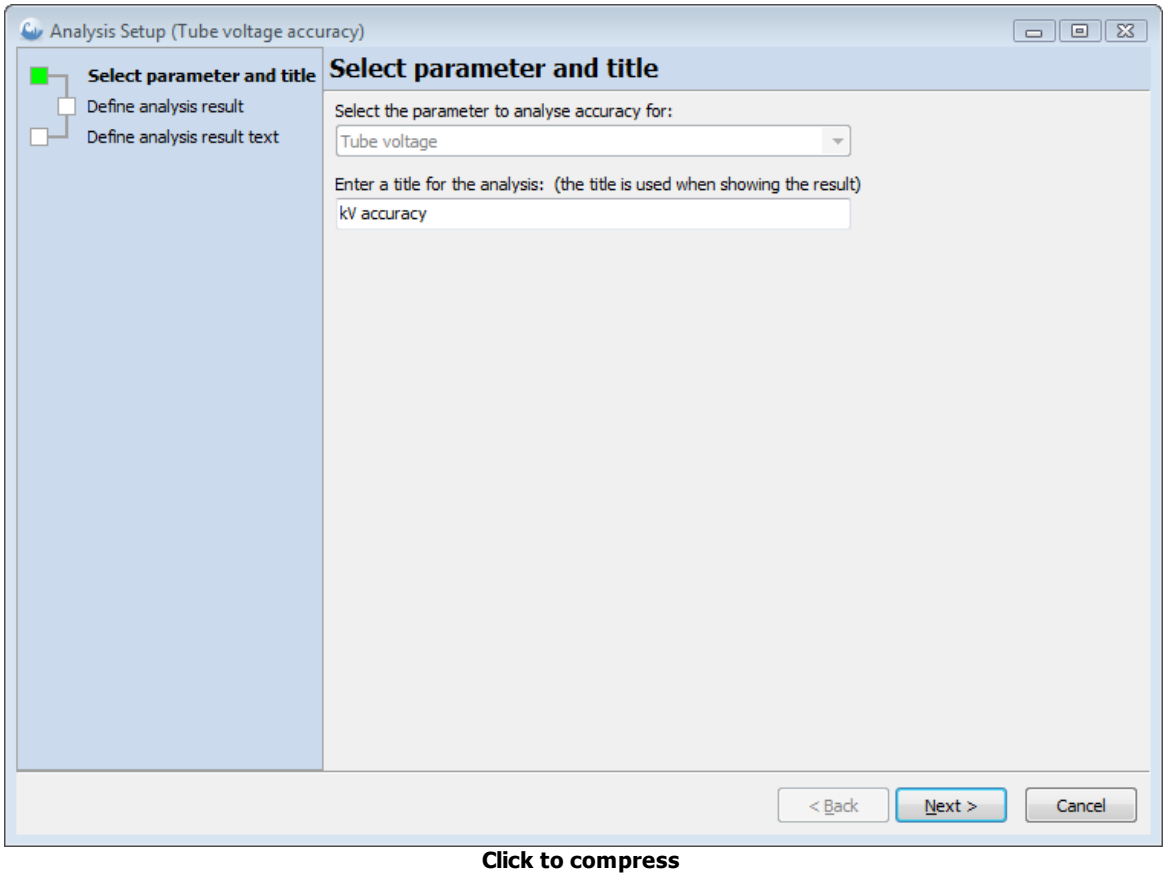
1. To access the analysis setup functions, we'll go to the Design page on the ribbon and click analysis Setup (the last item on the ribbon bar). Another way to access the same functions is if you right-click anywhere in the Analysis window and select Modify analysis from the drop-down list.

2. The first change on our list of things to do is to change the title from "Tube voltage accuracy" to "kV accuracy". To do this, we'll select the current title (in our example, it is the default "Tube voltage accuracy") and change it to what we want. When we clicked on the analysis setup function, the window that will pop first is the acceptance limit setup window showing the default values, that looks like the picture below.



Click to compress

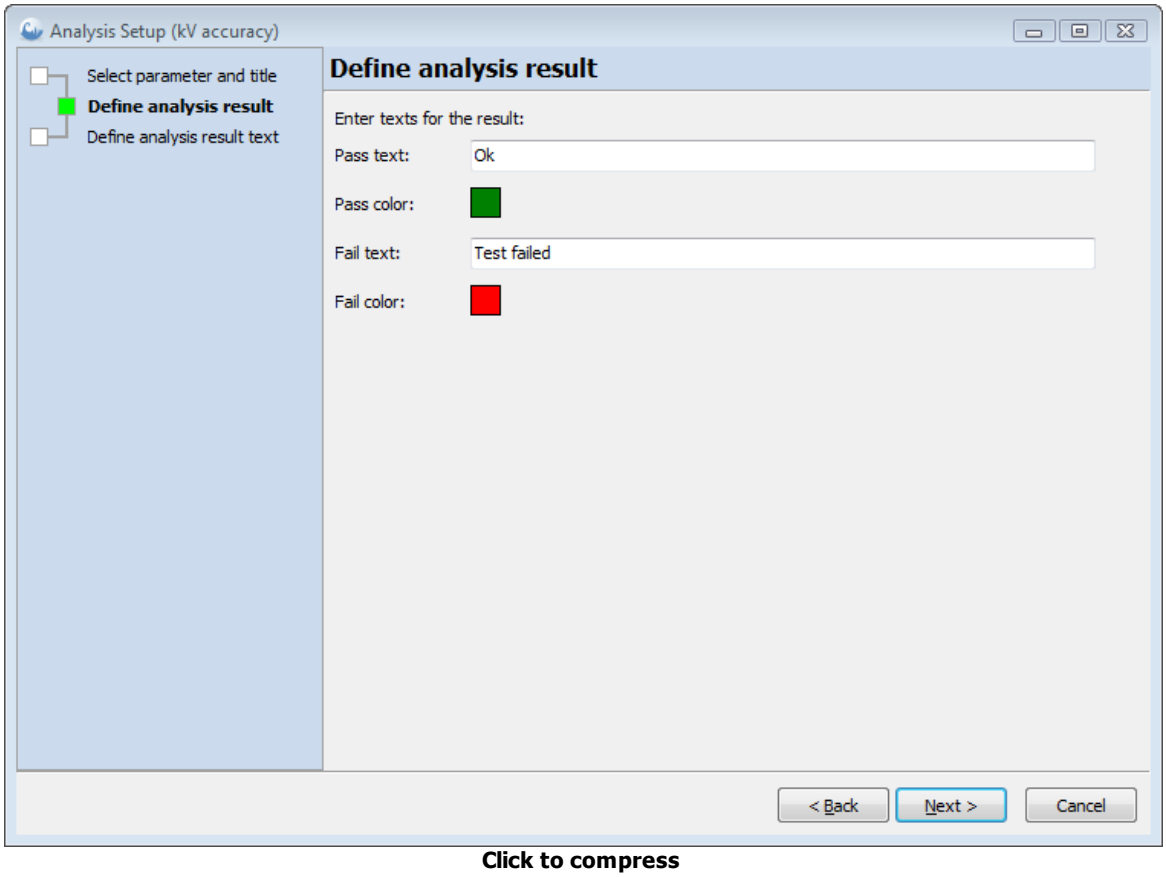
Since we don't want to change anything here right now (we'll get to this window further down our example), we'll click the More button to access the wizard that would allow us to change the title. The first window of the wizard looks like this:


Analysis Setup (Tube voltage accuracy)
Select parameter and title
Define analysis result
Define analysis result text
Select parameter and title
Select the parameter to analyse accuracy for:
Tube voltage
Enter a title for the analysis: (the title is used when showing the result)
kV accuracy
< Back
Next >
Cancel

Click to compress

3. The second line is where we'll change the title. Let's click in the text box and enter our new title "kV accuracy", then click next to continue with the wizard.

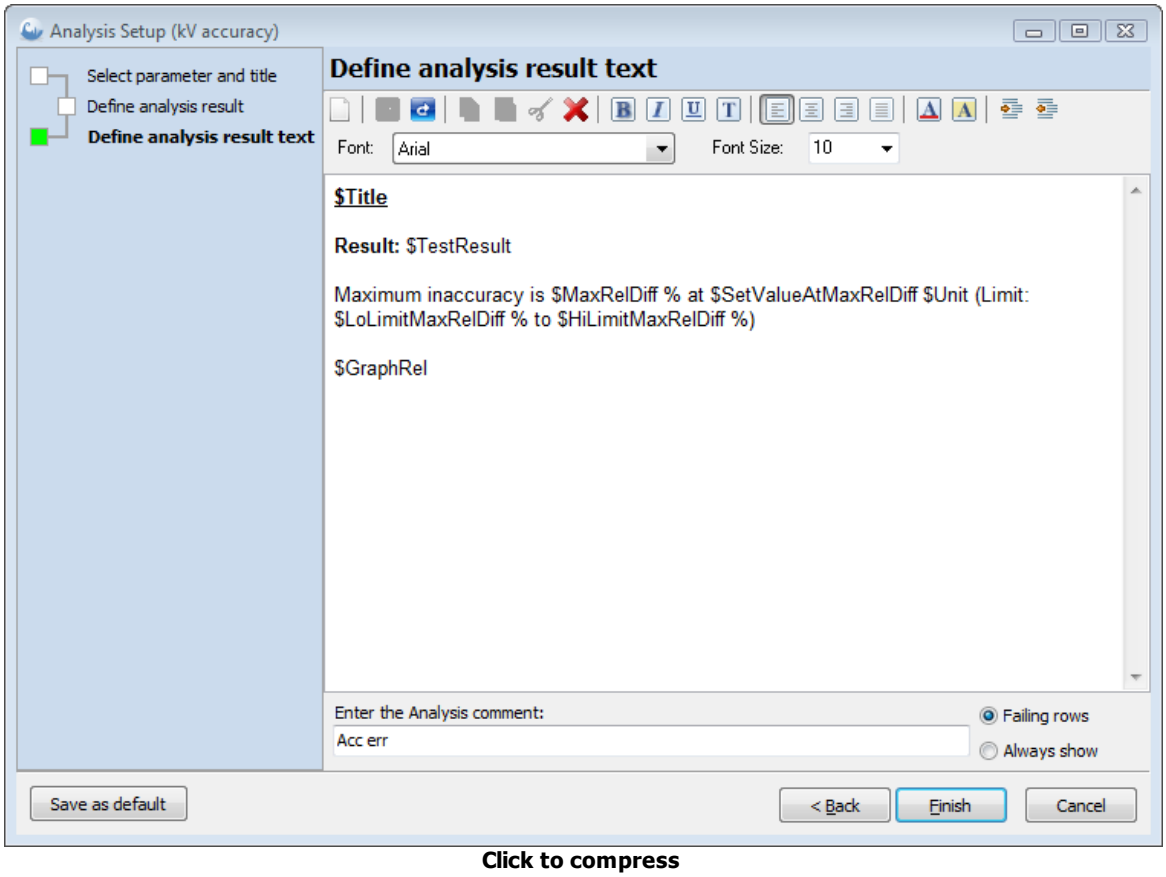
4. The next window of the wizard looks like the picture below. This is where we'll change the pass/fail text. Let's change it to what we want (in our example, we wanted the pass text to be "OK" and the fail text to be "Test failed"). Let's make these changes here, then click next to continue with the wizard.



Click to compress

5. The last page of the wizard looks like the picture below. This is where we can change the style and color of the text that appears in the analysis window. In our example, we wanted to do two things to the appearance of our analysis window text.

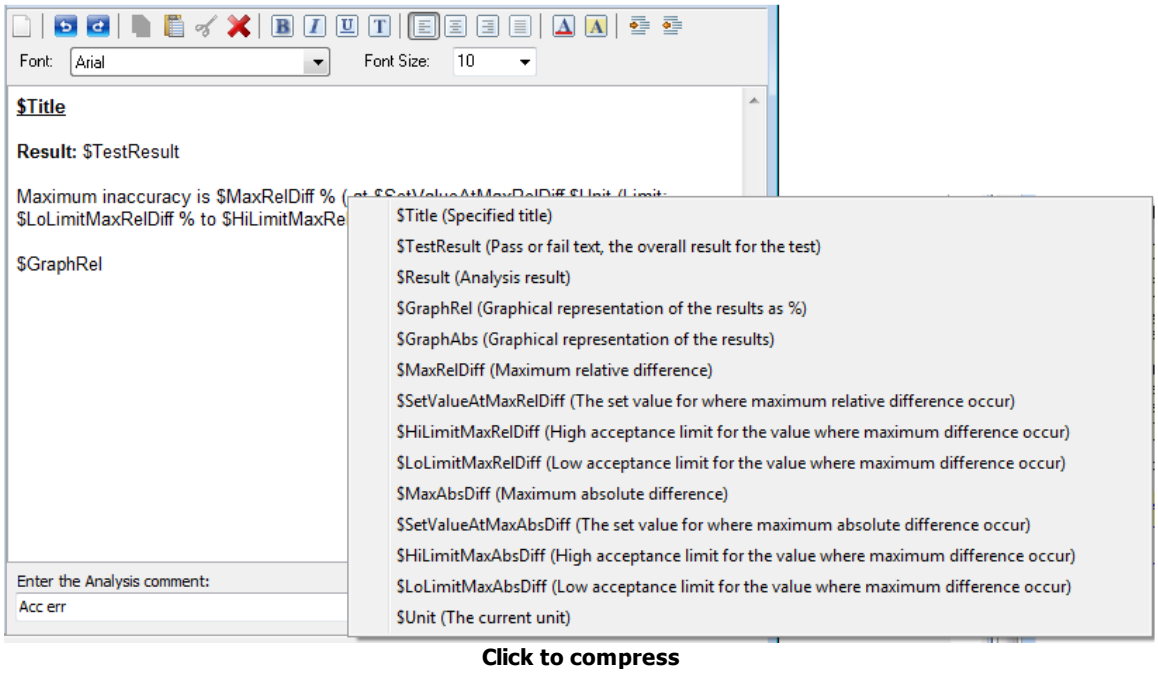
- We wanted to change the absolute deviation text to read like this: "Maximum inaccuracy is X.X % (X.X kV) at XX kV (Limit: -XX % to XX %)" where the red text is new, and
- We also wanted to increase the font size of the title text and make it light blue so it stands out from the rest of the text, and



Click to compress

The layout is built up of text and macros (a name preceded by a $) that will be exchanged with values from Ocean when the analysis result is shown. For example the macro $GraphRel will be exchanged with a graph showing the relative deviation.

Let's change the absolute deviation text now. We do this by placing our cursor after "$MaxRelDiff %" and type the dollar sign ($). As soon as we do that, a drop-down list appears with the available macros to choose from (see picture below).

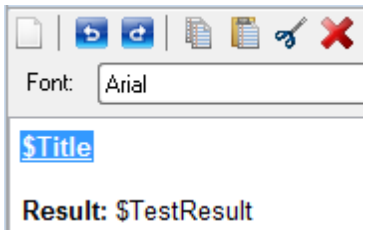

Font: Arial
Font Size: 10
$Title
Result: $TestResult
Maximum inaccuracy is $MaxRelDiff %
$LoLimitMaxRelDiff % to $HiLimitMaxRe
$GraphRel
Enter the Analysis comment:
Acc err
$Title (Specified title)
$TestResult (Pass or fail text, the overall result for the test)
$Result (Analysis result)
$GraphRel (Graphical representation of the results as %)
$GraphAbs (Graphical representation of the results)
$MaxRelDiff (Maximum relative difference)
$SetValueAtMaxRelDiff (The set value for where maximum relative difference occur)
$HiLimitMaxRelDiff (High acceptance limit for the value where maximum difference occur)
$LoLimitMaxRelDiff (Low acceptance limit for the value where maximum difference occur)
$MaxAbsDiff (Maximum absolute difference)
$SetValueAtMaxAbsDiff (The set value for where maximum absolute difference occur)
$HiLimitMaxAbsDiff (High acceptance limit for the value where maximum difference occur)
$LoLimitMaxAbsDiff (Low acceptance limit for the value where maximum difference occur)
$Unit (The current unit)

Click to compress

We'll select "$AbsDiffAtMaxRelDiff" from the list, add a space and select "$Unit" to get the text we

wanted. By using the macro $Unit instead of writing "kV" we made sure that our text will read correctly even if we the units.

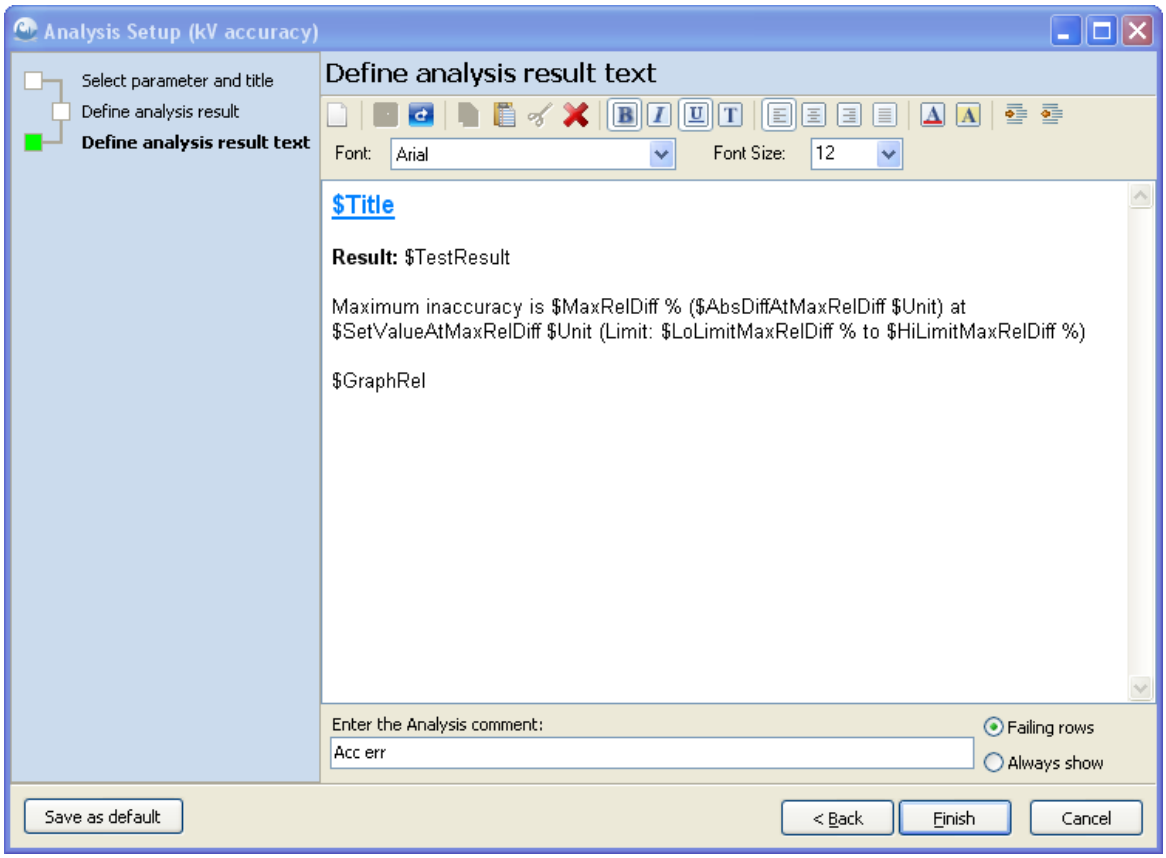
Before we finish with this page, we'll need to do one more thing and that is to change the font and color of the title text. To do this, we'll select the text "$Title",



then change the font size to 12p and change color to a light blue:



The new analysis result text window should look like this after we finished making all the changes we wanted.



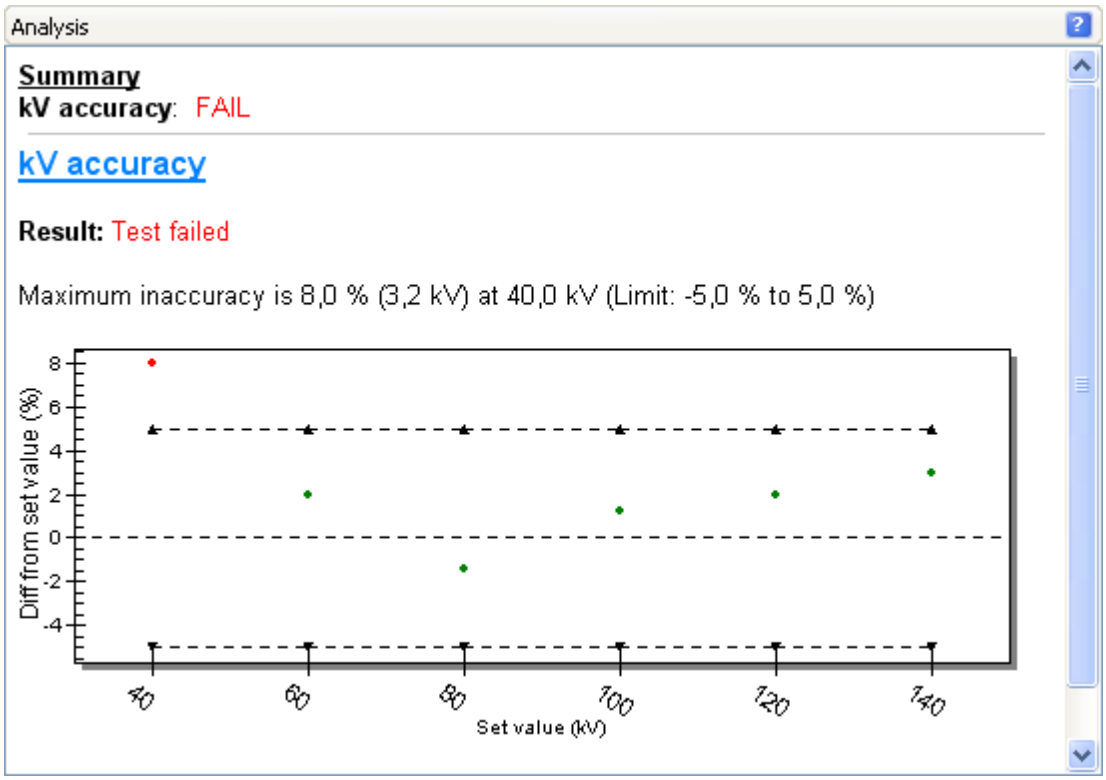
Click to compress

NOTE: The layout for kV accuracy analysis we just finished designing will affect the appearance of the current template only. The next time you add a kV accuracy analysis, the appearance will revert back to the default values (the ones we started with before all the modifications).

Let's say we really like the appearance of the one we just designed. We can make this the default appearance by clicking on the "Save as default" button on the bottom left of this last page of the wizard. This way the new appearance will be the default appearance for the kVp accuracy analysis.

The function of the field "Enter the Analysis comment" is described in the Analysis comment topic.

Since we made all the changes we wanted, we can click Finish to end the wizard. When the wizard ends, it will drop us back to the acceptance limits window. To exit the analysis setup, press OK, and you will be able to see the new appearance of the analysis texts appear in the window. If you followed along with us, your analysis window with all the changes we made should look like this:



Click to compress

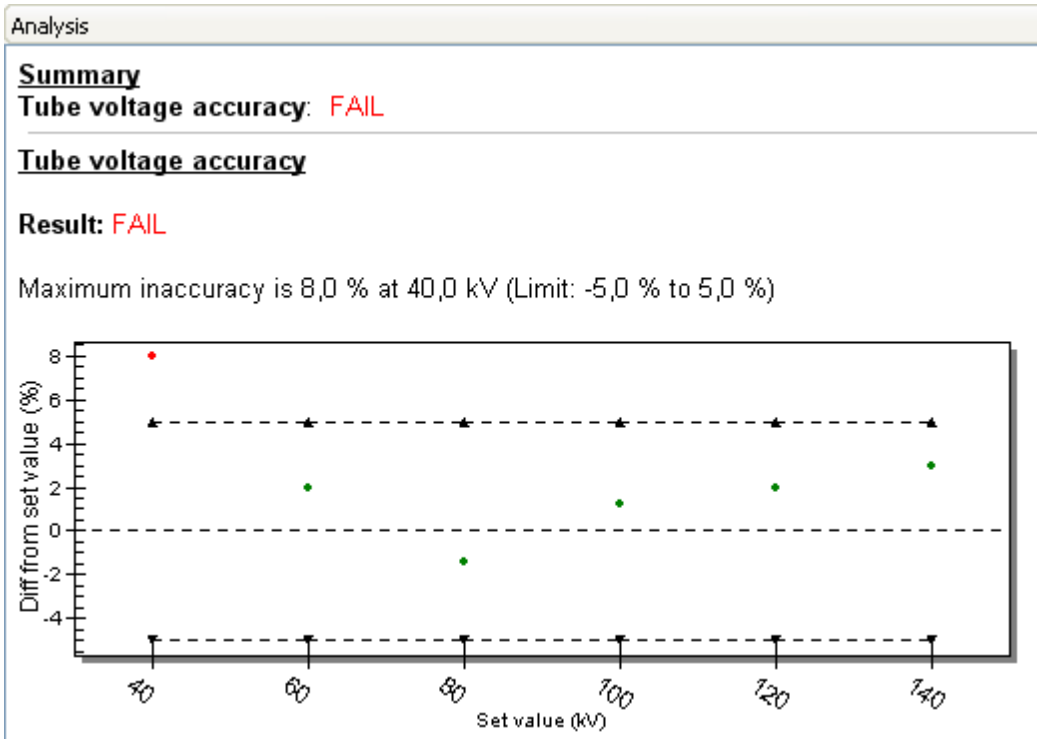
3.2.2.1.24.1 Acceptance limits

The acceptance limits shown when you add an analysis are the ones used in the default layout for the analysis. There may be other calculations you can ask Ocean to perform by modifying/expanding the default analysis. The topic Analysis (Definitions) describes each analysis and what they can do with the available acceptance limits.

In the following example, we will cover how to expand a default analysis to perform calculations not present in the default analysis. Let's assume, that we added a kV Accuracy analysis to a test template. The default analysis calculates the relative difference between your measured values and the set values (reference values), but this is not all you have available to you.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
▶	1	40	43,2	8,0		
	2	60	61,2	2,0		
	3	80	78,9	-1,4		
	4	100	101,2	1,2		
	5	120	122,3	1,9		
	6	140	144,2	3,0		

The picture below is what a default analysis looks like.



Click to compress

The following steps will show you how expand the above criteria and verify that the measure kV is within +/- 5 % or +/- 4 kV from the set value you specified. This is a fairly simple example commonly used in X-ray compliance testing all over the world.

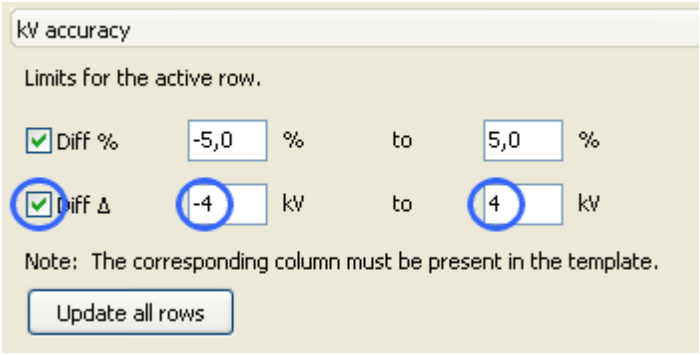
1. The first thing we need to do is add a new column that will show shows the difference between the measured values and the set values. This is the "Diff Δ" column. How to add a column is discussed in detail in the Add/delete column topic. The template will look like the picture below after we added the column we needed.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	kVp diff Δ (kV)	Exposure time (ms)	Exposure (mGy)
▶	1	40	43,2	8,0			
	2	60	61,2	2,0			
	3	80	78,9	-1,4			
	4	100	101,2	1,2			
	5	120	122,3	1,9			
	6	140	144,2	3,0			

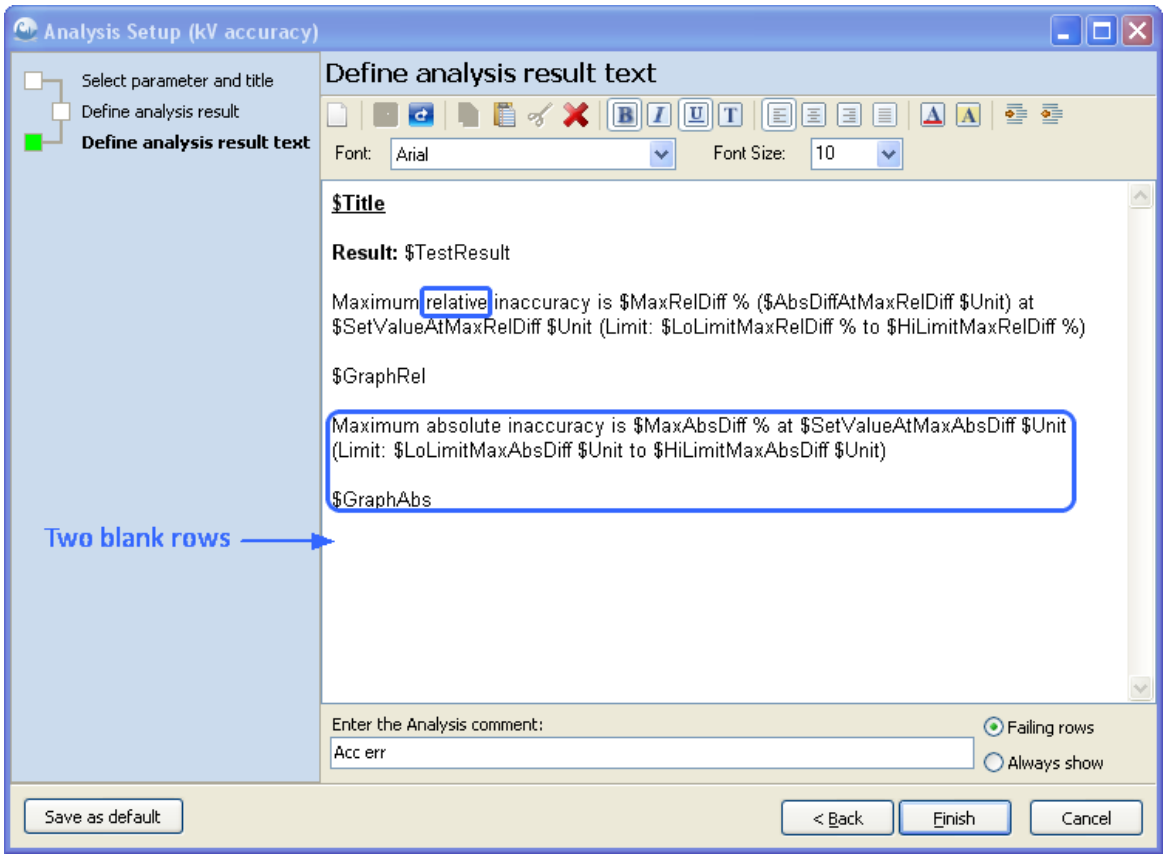
2. The next thing we need to do is modify the default analysis so it will know to evaluate the new parameter. We do this by right-clicking on the Analysis window and selecting "Modify analysis" from the

drop-down list, and choose the "kV accuracy" (or the name you have given this analysis) choice. You can also go to the ribbon bar and click on the Analysis setup button to select the analysis you want to modify.

3. The window you'll see next will look like the picture below, showing the section where we can set the acceptance limits. For our example, we'll check off the "Diff %" and specify the +/- 5 % limit we want in our example, and then check off the "Diff Δ" and specify the +/- 4 kV as shown in our example. To finish this part of the analysis modification, we'll click the "Update all rows" button (you could also select all rows with multi-select if you want) so our grid is updated with the new columns and specifications we just entered.



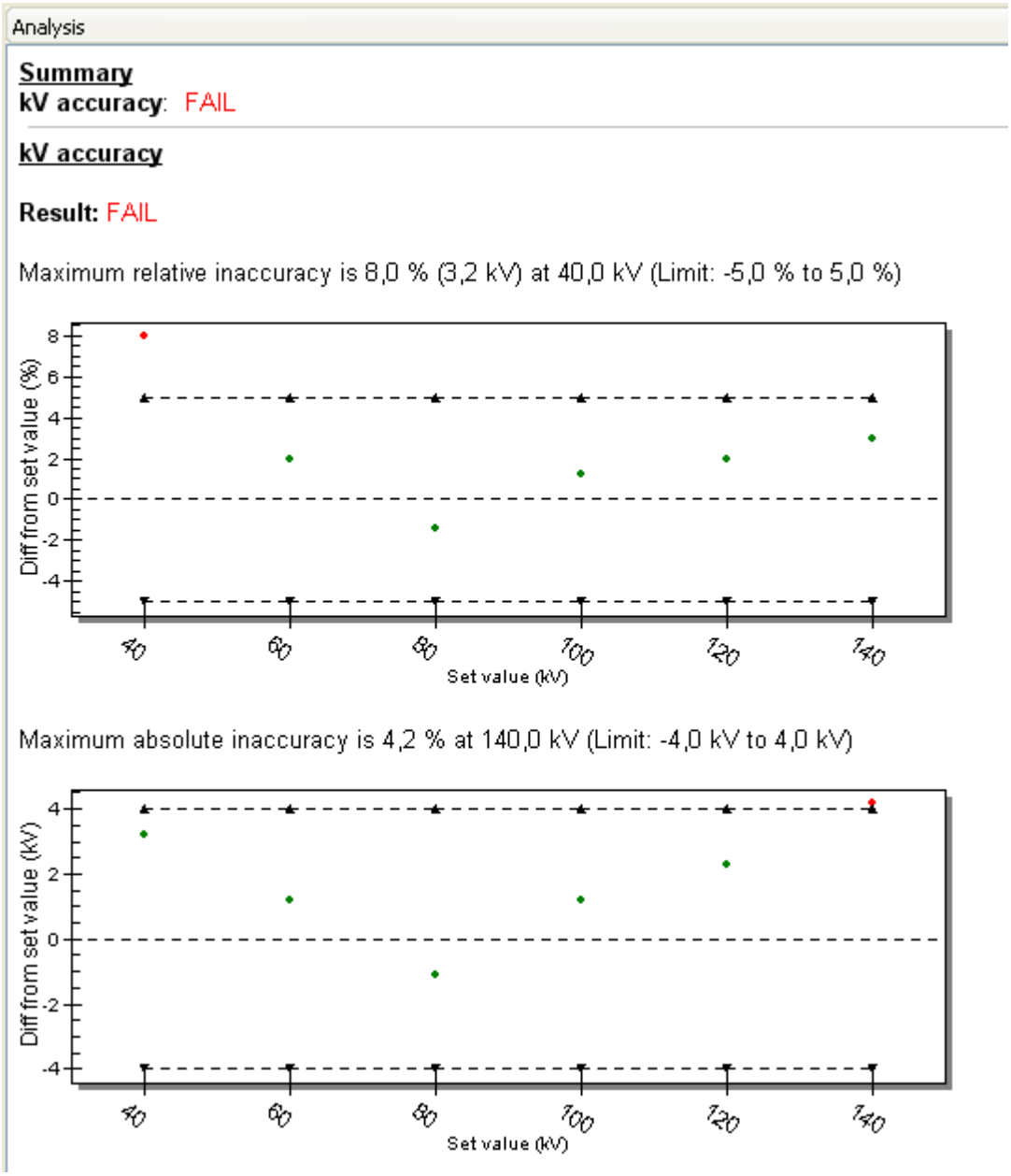
4. Now we want to modify the layout to show the results of the new calculation. Click on the "More..." button to start the analysis setup wizard, then click the Next button twice to come to the "Define analysis result text" selection. You will see a window like the one below, showing what is in the blue band, which is the default text, but we now need to modify it to talk about the new calculation we just added. The paragraph above the default text is an example text you may want to use to describe your modified analysis results. What we did was change one word... "absolute" to "relative" in the paragraph and all of a sudden we are now talking about something else. When we are done we'll just click Finish to end the setup wizard and save our changes.



Click to compress

Normally, we advise that you leave two blank rows after each analysis to separate them from each other in the report, if you use more than one analysis in the same test template.

5. Once the wizard is done, you will be dropped back to the Analysis window. Click OK now to save your work. Once you did that, the Analysis window should show the new results, like the window below.



Click to compress

The modified template should look like this now:

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	kVp diff Δ (kV)	Exposure time (ms)	Exposure (mGy)
	1	40	43,2	8,0	3,20		
▶	2	60	61,2	2,0	1,20		
	3	80	78,9	-1,4	-1,10		
	4	100	101,2	1,2	1,20		
	5	120	122,3	1,9	2,30		
	6	140	144,2	3,0	4,20		

It shows that the first exposure failed because the result is outside +/- 5% range, and the last exposure failed because the result is outside +/- 4 kV range.

3.2.2.1.24.2 Reference a value from the grid

In some cases you may want to reference a measured value in the grid in your analysis text. Assume that you are measuring HVL using the following test:

Summary | ✓ HVL | kVp Reproducibility | kVp Accuracy | Radiog

Set mAs (mAs)	Set kV (kV)
2.5	80

View / Select	#	Set Added filtr. (mm Al)	Exposure (mGy)
▶	1	0.0	0.3006
	2	1.0	0.2341
	3	2.0	0.1847
	4	3.0	0.1588
	5	4.0	0.1276

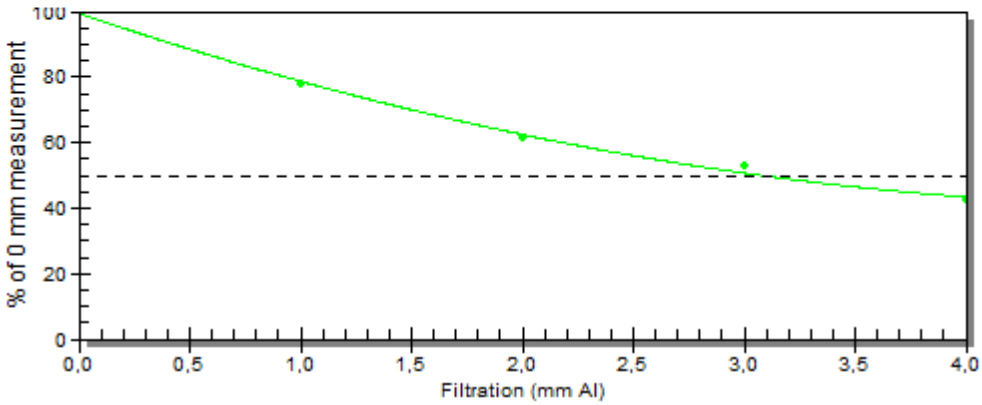
The analysis text looks like this:

Half Value Layer

Result: Pass

HVL is 3.190 mm Al
HVL limit: minimum 2.300 mm Al

Estimated total filtration: 3.219 mm Al



Click to compress

Assume that we want to add the following text to the analysis. It should be placed below the graph:

"Measured exposure with 0 mm Al was: X.XXX mGy"

Do the following:

1. Right-click on the first cell in the Exposure column.

2. Select "Edit cell name" from the menu.

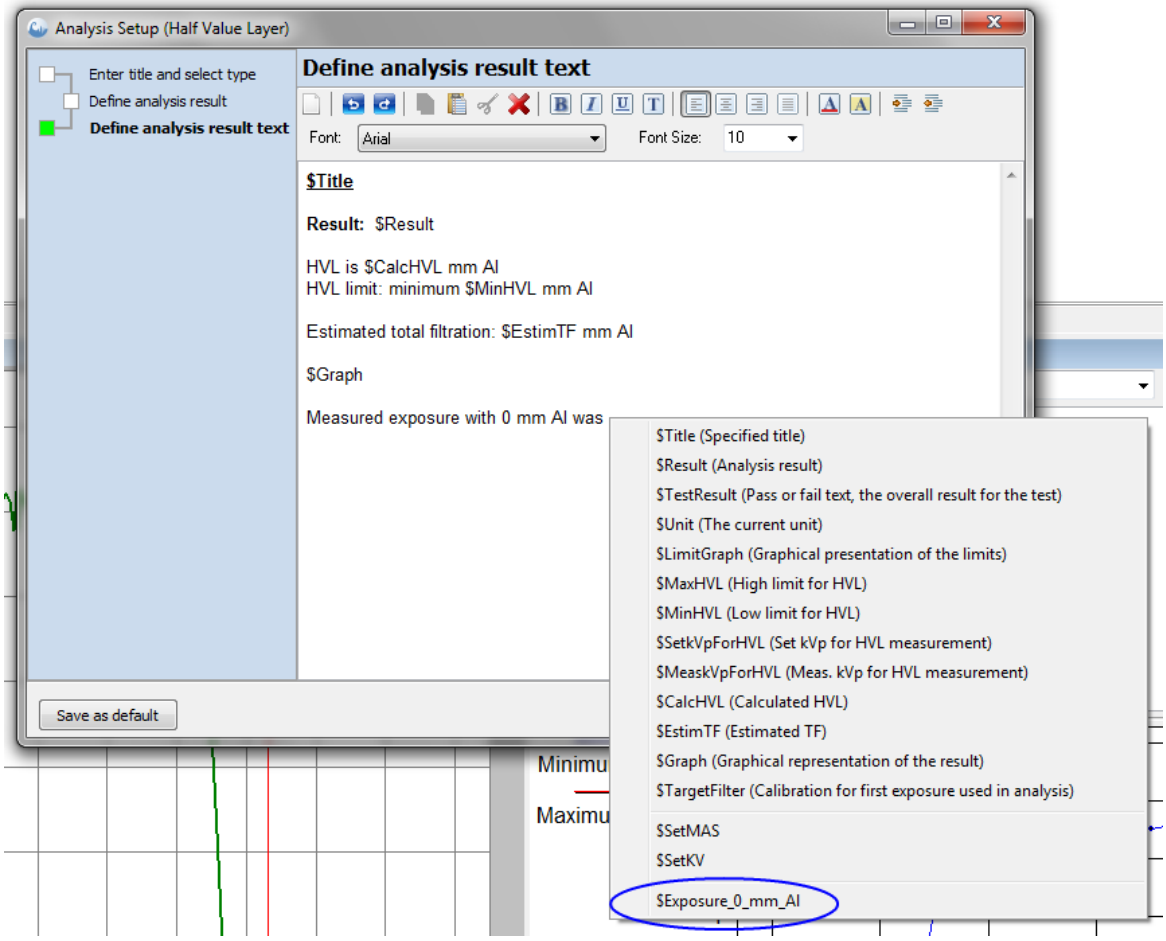
3. Give the cell the name "Exposure_0_mm_Al" and click OK.

4. Now right-click on the analysis.

5. From the menu select "Modify analysis or trend" and select the Half Value Layer analysis.

6. Click on the More... button.

7. A wizard starts; click on next until you come to the "Define analysis result text" page.

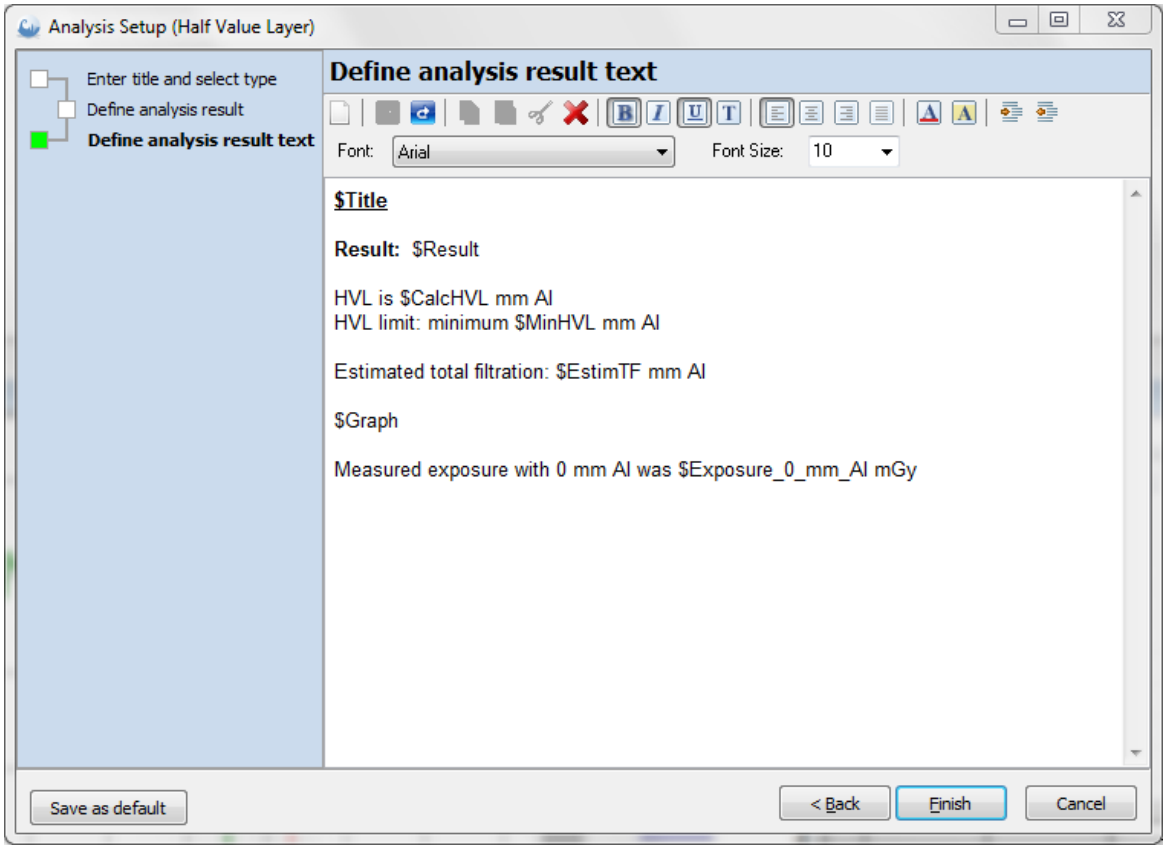

Analysis Setup (Half Value Layer)
Enter title and select type
Define analysis result
Define analysis result text
Define analysis result text
Font: Arial
Font Size: 10
$Title
Result: $Result
HVL is $CalcHVL mm Al
HVL limit: minimum $MinHVL mm Al
Estimated total filtration: $EstimTF mm Al
$Graph
Measured exposure with 0 mm Al was
Save as default
$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$Unit (The current unit)
$LimitGraph (Graphical presentation of the limits)
$MaxHVL (High limit for HVL)
$MinHVL (Low limit for HVL)
$SetkVpForHVL (Set kVp for HVL measurement)
$MeaskVpForHVL (Meas. kVp for HVL measurement)
$CalcHVL (Calculated HVL)
$EstimTF (Estimated TF)
$Graph (Graphical representation of the result)
$TargetFilter (Calibration for first exposure used in analysis)
$SetMAS
$SetKV
$Exposure_0_mm_Al

Click to compress

8. Type the new text below the graph macro. To insert the exposure value type "$". The list with all macros will automatically pop up. Your cell name will be shown and you can select it.

9. Type a space followed by "mGy".

10. Your analysis text should now look like this:



Click to compress

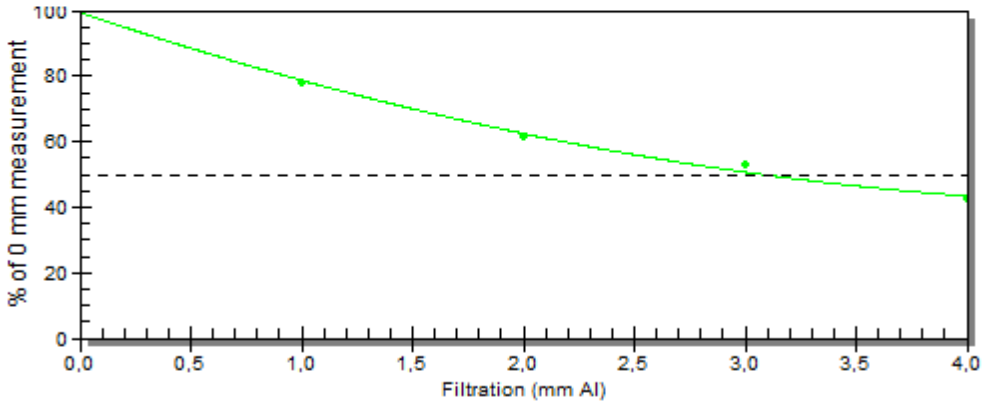
11. Click on Finish and then OK. The result should now look like this:

Half Value Layer

Result: Pass

HVL is 3.190 mm Al
HVL limit: minimum 2.300 mm Al

Estimated total filtration: 3.219 mm Al

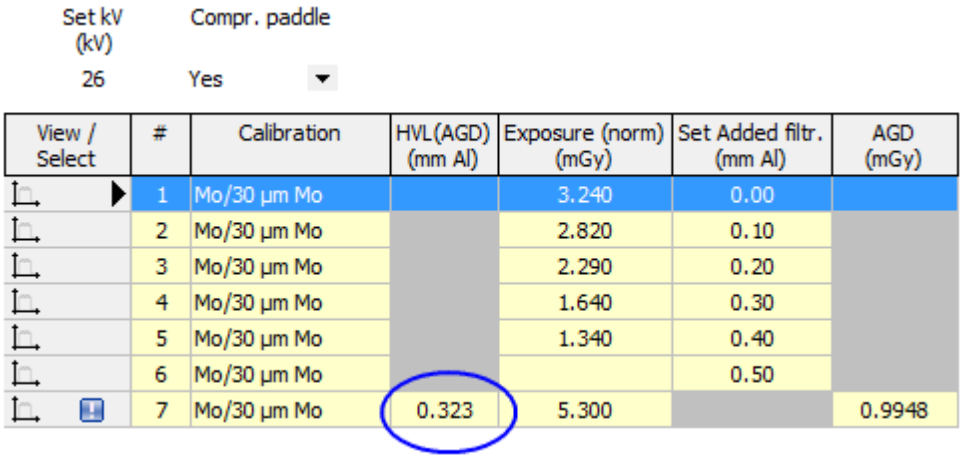


Measured exposure with 0 mm Al was 0.3006 mGy

Click to compress

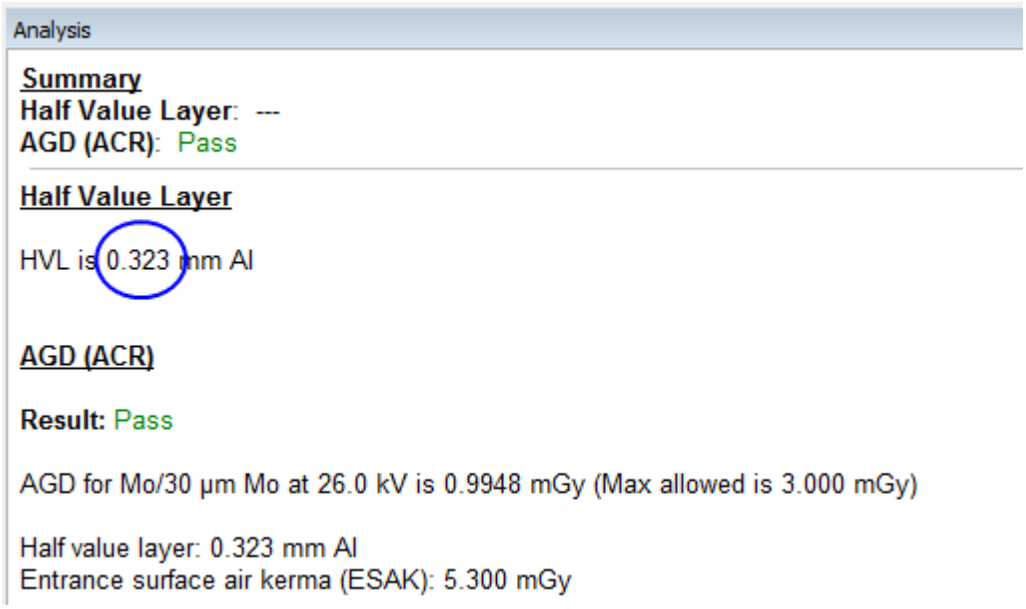
3.2.2.1.24.3 Show a value from analysis in the grid

In some situation it is convenient to be able to automatically put values from the analysis into a cell in the grid. One example is the AGD analysis:



Click to compress

When measuring AGD you start with an HVL measurement. This is row 1 to 6, the calculated HVL value is shown in the HVL analysis. Row 7 is the measurement of ESAK. To calculate the AGD, the HVL value is required in the marked cell in the picture above.


Analysis
Summary
Half Value Layer: ---
AGD (ACR): Pass
Half Value Layer
HVL is 0.323 mm Al
AGD (ACR)
Result: Pass
AGD for Mo/30 µm Mo at 26.0 kV is 0.9948 mGy (Max allowed is 3.000 mGy)
Half value layer: 0.323 mm Al
Entrance surface air kerma (ESAK): 5.300 mGy

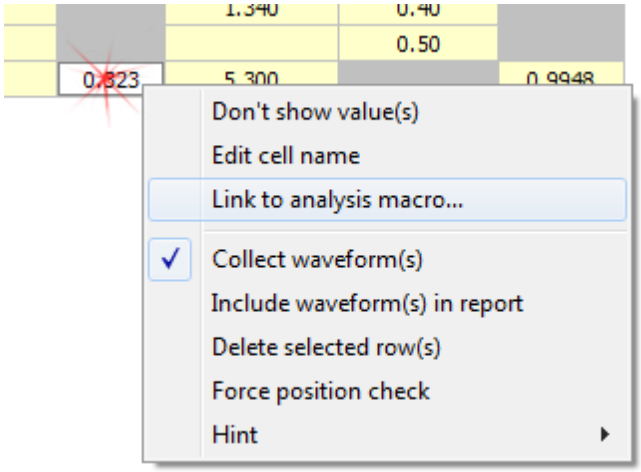
Click to compress

You can enter the calculated HVL value manually or create a link from the analysis to the cell where you want the HVL value. If you create a link, the HVL value will automatically appear in the cell as soon as it is available.

Links from analysis to cells can be created for two column types, to the column "HVL (AGD) (Measured)" and the user-defined column "Numeric value (Measured)".

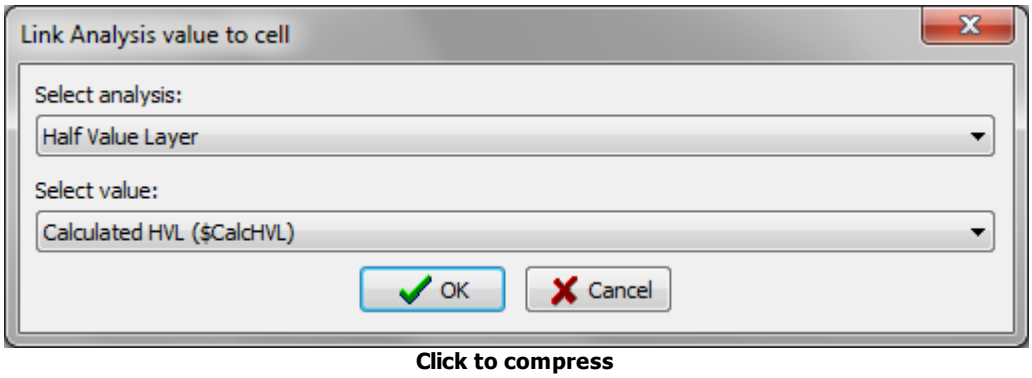
To create a link from an analysis to a cell (AGD example):

1. In the AGD test right-click on the cell where you want the HVL value to appear.



Click to compress

2. Select "Link to analysis macro..." from the menu. A dialogue is shown:



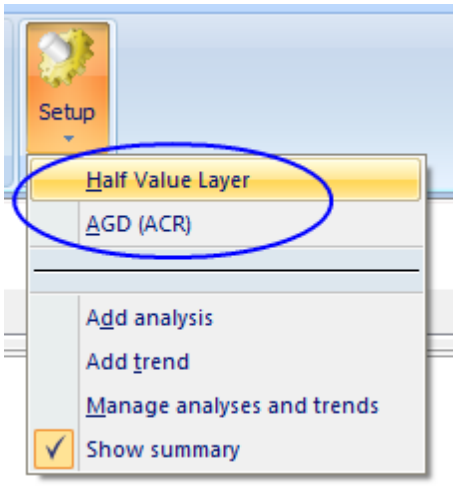
Click to compress

3. Select the analysis and which value you want to show up in the cell. In this case we select the HVL analysis and the calculated HVL value.

4. Click OK.

The cell will now be updated with exactly the same value that is calculated by the HVL analysis.

Note!
In this case must HVL be shown before the AGD analysis in the list of analysis.



Click to compress

3.2.2.1.24.4 Use for analysis

Each type of analysis in Ocean can be used on only one column in a test. The example below will illustrate this and how you define which column to use:

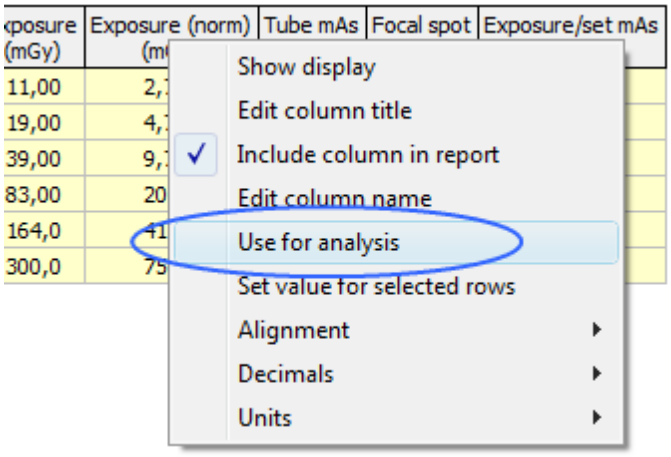
Let's assume you are measuring exposure and you have one column with measured and one with normalized exposure values. You are going to evaluate the mA linearity and you want to use the normalized exposure values to do this. Your template looks like this:

SSD (cm)	SDD (cm)	Set kV (kV)
100,0	50,00	80,0

View / Select	#	Set mAs (mAs)	Exposure (mGy)	Exposure (norm) (mGy)	Tube mAs	Focal spot	Exposure/set mAs (mGy/mAs)
	1	20,00	11,00	2,750	20,00	Small	0,5500
	2	40,00	19,00	4,750	40,00	Small	0,4750
	3	80,00	39,00	9,750	80,00	Small	0,4875
	4	160,0	83,00	20,75	160,0	Small	0,5188
	5	320,0	164,0	41,00	320,0	Small	0,5125
	6	640,0	300,0	75,00	640,0	Small	0,4688

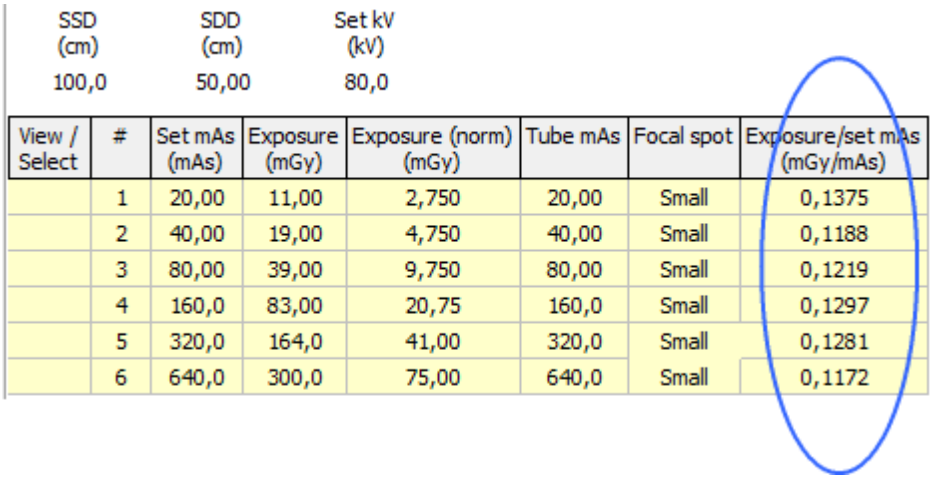
Click to minimize

1. The mA linearity analysis is calculating the linearity on the Exposure/mAs column, using the measured values and not on the normalized values as you want. To get the results you want, you need to change which column is used for the linearity analysis. To do this, right-click on the "Exposure(norm)" column:



Click to minimize

2. Now click on "Use for analysis". As you can see, the values in the "Exposure/mAs" column are recalculated and the normalized exposure is used instead.



SSD (cm)	SDD (cm)	Set kV (kV)
100,0	50,00	80,0

View / Select	#	Set mAs (mAs)	Exposure (mGy)	Exposure (norm) (mGy)	Tube mAs	Focal spot	Exposure/set mAs (mGy/mAs)
	1	20,00	11,00	2,750	20,00	Small	0,1375
	2	40,00	19,00	4,750	40,00	Small	0,1188
	3	80,00	39,00	9,750	80,00	Small	0,1219
	4	160,0	83,00	20,75	160,0	Small	0,1297
	5	320,0	164,0	41,00	320,0	Small	0,1281
	6	640,0	300,0	75,00	640,0	Small	0,1172

Click to minimize

3.2.2.1.24.5 Analysis comment

The analysis comment is a special feature that can be used to:

- show a text on failing rows to indicate which analysis that failed
- show a text on each row that can contain also the macros (names proceeded by "$")

To display analysis comments, you need to add an "Analysis comment" column. Take a look at the before (first picture) and the after (second picture) the analysis comment is added.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)
	1	40	43,2	8,0		
▶	2	60	61,2	2,0		
	3	80	78,9	-1,4		
	4	100	101,2	1,2		
	5	120	122,3	1,9		
	6	140	144,2	3,0		

In this picture, you can see the extra column titled "Analysis comment" with some text in it (you can see how to add a column here).

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)	Analysis comment
	1	40	43,2	8,0			Acc err
▶	2	60	61,2	2,0			
	3	80	78,9	-1,4			
	4	100	101,2	1,2			
	5	120	122,3	1,9			
	6	140	144,2	3,0			

You can see that in this example, the new column indicates that the Accuracy analysis failed. If you are performing more than one analysis on one row of data and they both fail, both analyses will put their respective errors in the Analysis Comment column in the first row and it will be listed as first error, second error. For example, let's assume that we were analyzing Accuracy and Reproducibility on one row and they both failed, the Analysis comment column will record the errors as "Acc err, Repro err".

The above way of showing the errors is the default way when you use the Analysis comment column, however, it doesn't say very much, except that an analysis failed. We felt it would be great if an analysis failure can provide us with some more detail as to why it failed, so we added a new feature to Ocean to enable you to change the error text in the Analysis comment column to tell you why the analysis failed and not just that it did. This is very helpful when diagnosing an X-ray system problem.

Indicate a failing result

:To change the text of the Analysis comment column, follow these simple steps:

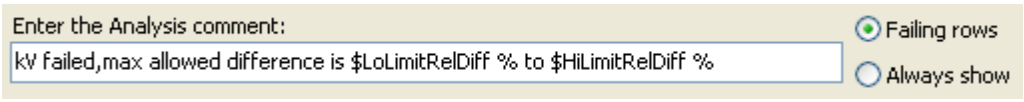
1. Right-click on the analysis window, select modify from the menu and click the analysis you want to modify.

2. The analysis window shows the acceptance limits. Click the "More..." button and a wizard will start to show you the "Define analysis result text" choice. This is where we'll enter our new text to show instead of the default text.

3. At the bottom of the window you have the following line showing the default Analysis comment field text.



To change this, click in the text field and enter your text. For our example, we entered the following:


Enter the Analysis comment:
kV failed,max allowed difference is $LoLimitRelDiff % to $HiLimitRelDiff %
Failing rows
Always show

The template will now look like the picture below (increase the width for the Analysis comment column). Notice the new text is now shown in the Analysis comment field.

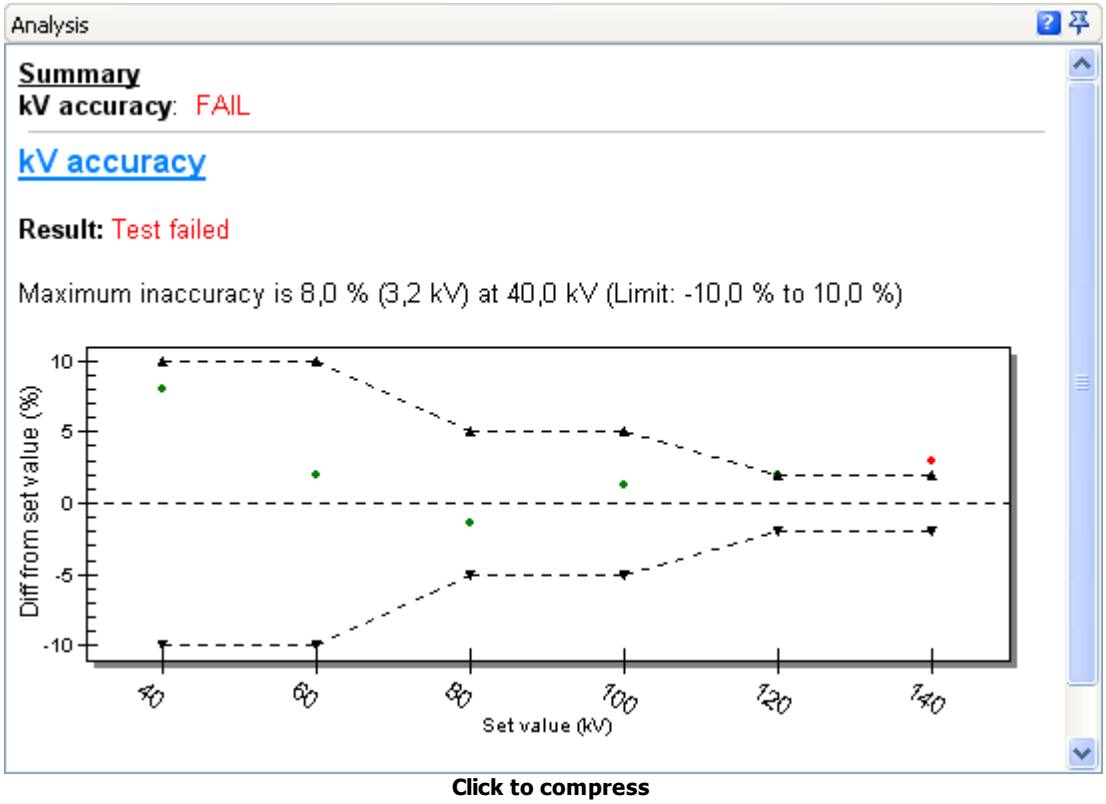
View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)	Analysis comment
	1	40	43,2	8,0			kV failed,max allowed difference is -5,0 % to 5,0 %
▶	2	60	61,2	2,0			
	3	80	78,9	-1,4			
	4	100	101,2	1,2			
	5	120	122,3	1,9			
	6	140	144,2	3,0			

Click to compress

-End-

Show for every failed row

Let's assume that we have different acceptance limits in the test template above, for example, ±10 % for exposure #1 and #2, and ±5 % for exposure #3 and #4, and ±2 % for exposure #5 and #6. The analysis result looks like this:



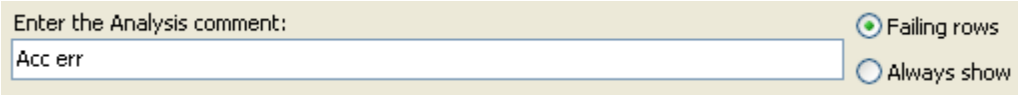
Click to compress

You can use the Analysis comment field if you want to see this in the grid. Here are the steps to follow to modify the analysis:

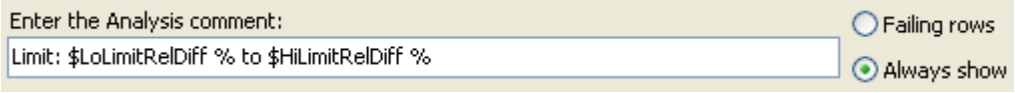
1. Right-click on the analysis window, select modify from the menu and click the analysis you want to modify.

2. The analysis window shows the acceptance limits. Click the "More..." button and a wizard will start to show you the "Define analysis result text" choice. We will enter our new text in the text field.

3. At the bottom of the window you have the following line showing the default Analysis comment field text and two radio buttons. One is "Failing rows" the other is "Always show". The default is "Failing rows".



The template will now look like the picture below (increase the width for the Analysis comment column). Notice the new text is now shown in the Analysis comment field. In addition, we will click the "Always show" radio button.



Now the radio button "Always show" is selected and the Analysis comment text will appear for all rows, not just the failing ones.

The test template now looks like this:

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure time (ms)	Exposure (mGy)	Analysis comment
	1	40	43,2	8,0			Limit: -10,0 % to 10,0 %
▶	2	60	61,2	2,0			Limit: -10,0 % to 10,0 %
	3	80	78,9	-1,4			Limit: -5,0 % to 5,0 %
	4	100	101,2	1,2			Limit: -5,0 % to 5,0 %
	5	120	122,3	1,9			Limit: -2,0 % to 2,0 %
	6	140	144,2	3,0			Limit: -2,0 % to 2,0 %

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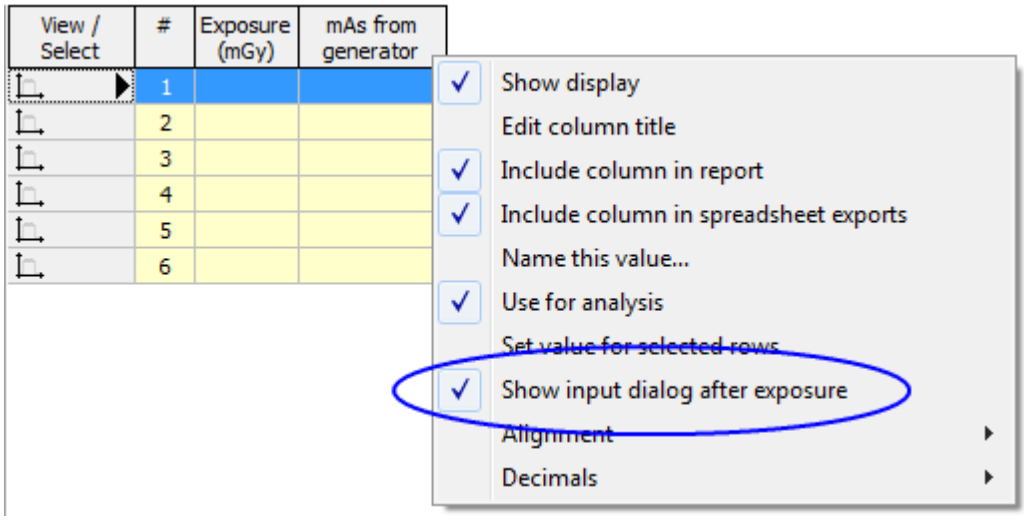
-End-

3.2.2.1.25 User-defined columns

There are a number of user-defined columns that can be used for different purposes. These column can be used in some analysis and can be used in user-defined calculations. The available user-defined columns are described in the topic User-defined, User-defined calculations and User-defined numeric value.

You add user-defined columns to your template the same way as you add any other column, see topic Add/delete column or general settings.

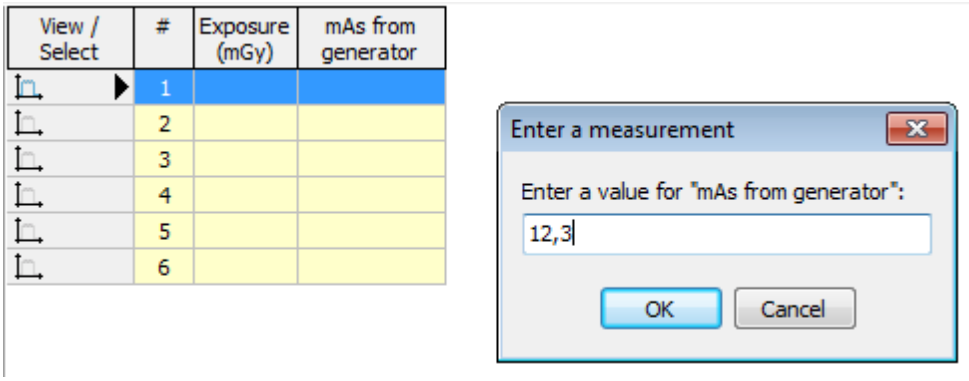
If you want to enter your own values you can use the User-defined numeric value column or User-defined text value column. If you are going to enter a value for each exposure you do, it may be convinent to enable an input dialogue. If you do that, the dialogue pops up automatically for each exposure you do to simplify the input of data:



Click to compress

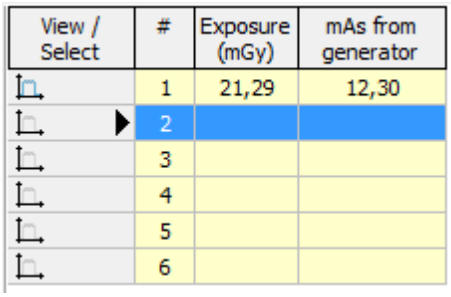
Enable the input dialogue.

When you make an exposure, the input dialogue appears automatically:



Click to compress

Type the value and click on OK. The measured value and the value you entered are now shown in the grid:



You can now make the next exposure.

If you don't want input dialogue to appear for a certain rows (or a single row) you can disable it in the following way:

1. Select the row(s) you don't want a input dialogue for.

2. Right-click on the selection.

3.Click on "No "input" dialogue".

3.2.2.2 Design a checklist template

You can design your own checklist templates. They can be adapted to your own requirements to maximize speed, efficiency and user-friendliness.

Designing a checklist template involves the following steps:

1. Create the grid with the columns you need.
2. Create questions/tasks/headings in your test template.
3. Change order and width of columns.
4. Add supporting information (documents and web links).
5. Add analysis.

3.2.2.2.1 Create the grid

The first step in designing a checklist template is to create the grid (rows and columns). Your meter does not need to be connected while designing the checklist template.

As an example of how to create a checklist template, we will go through the steps necessary to create a grid that is shown in the picture below.

Radiographic questions

Test date:

Questionnaire

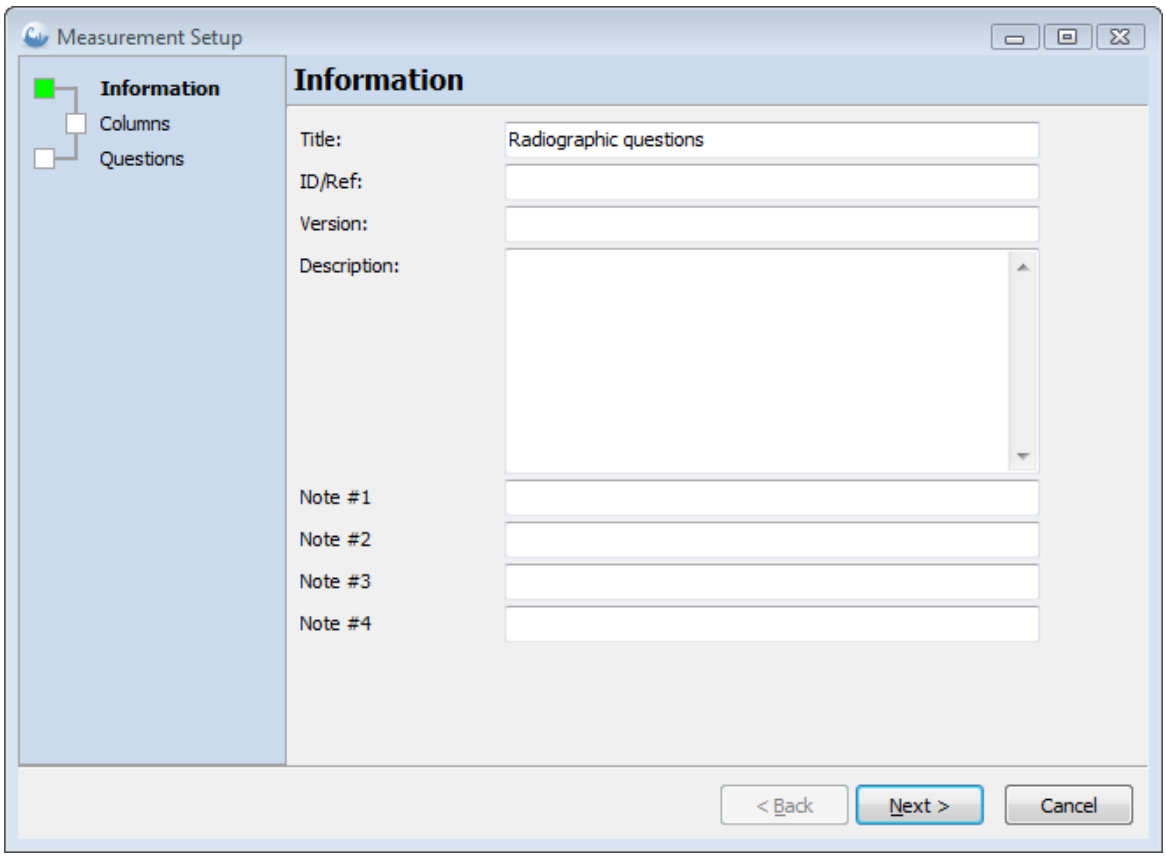
#	Question	Answer	Result	Recommendation
1	**OPERATOR PROTECTION**			
2	Exposure switch mounted properly?			
3	Gloves and aprons available			
4	**PATIENT PROTECTION**			
5	Gonadal protection provided?			
6	Technique charts available?			

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Follow the easy steps below to create your own checklist grid:

1. The first step is to go to the Design page on the ribbon bar and select Checklist from the Template button.

2. This will start the new checklist template wizard to help guide you through the process. You will see that Status bar #2 is indicating that you are designing a checklist template in Design mode. You need to enter a title for the checklist and a type (for our example we will create a set of radiographic questions, so we will call the type "Radiographic questions" for easy reference. The checklist we are making will be referred to by its title throughout Ocean whenever we use this particular checklist template.

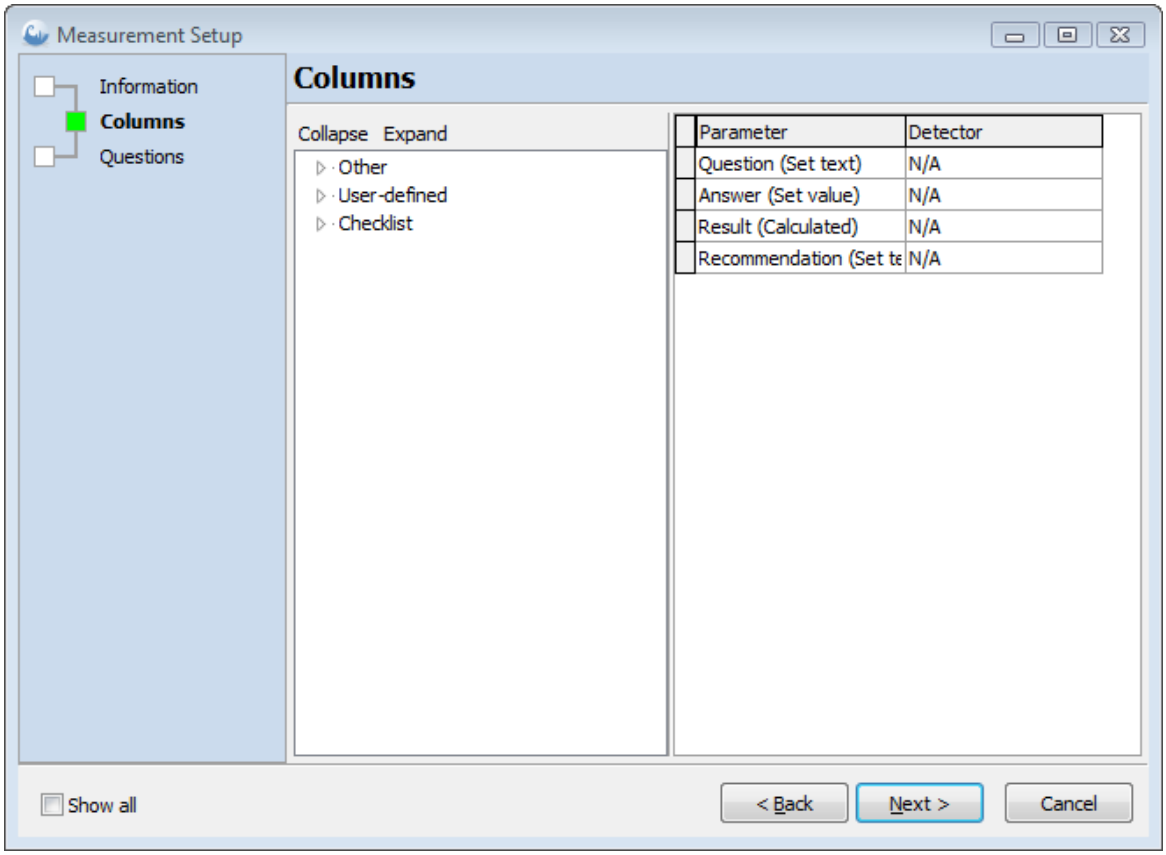


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As you can see on the picture above, there are other fields on this page not used by Ocean, but sometimes you, as the user, would want to put more than just a title and a type to identify your checklists. For instance, a description would be very handy to have in a checklist when you pass

templates along to other Ocean users to make your checklists different from the ones they created for themselves. When you have finished entering all the information you want, click Next to continue.

3. The next page of the wizard will look like the picture below. This is where you can select the columns you want to have in your checklist. The columns on the right are the columns that will be present in your checklist. As you can see, there are four suggested columns already chosen for you when you get to this page.



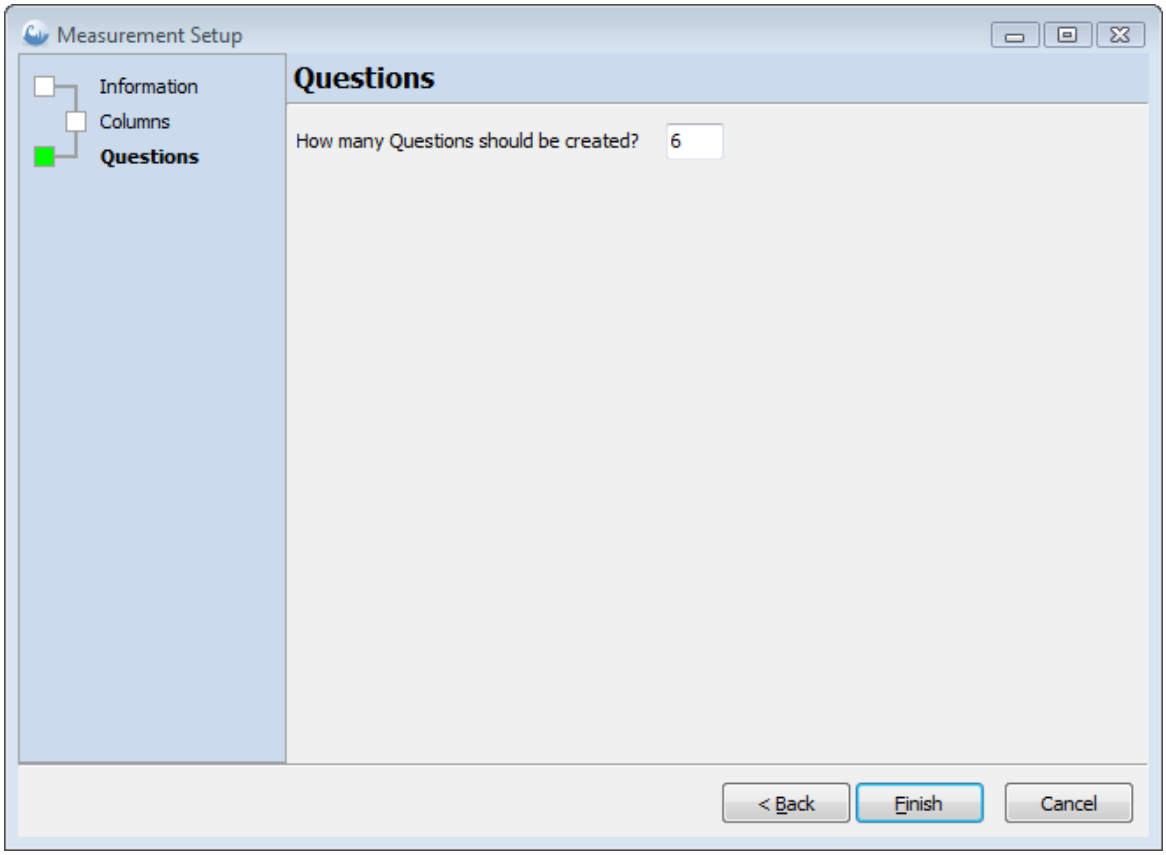
Click to compress

The four columns are:

Questions: This is where you will be typing your question text, therefore, this column must be present in the grid.
Answer: This is where you will be typing the answer text, therefore, this column must be present in the grid.
Result: This is where you can define the pass/fail criteria for your question. This column is optional and you can delete it if you want.
Recommendation: This is another optional column that would be used to show a recommended action to be taken if this question fails.

For our example, we will use the pre-selected columns only and click Next to continue with the example.

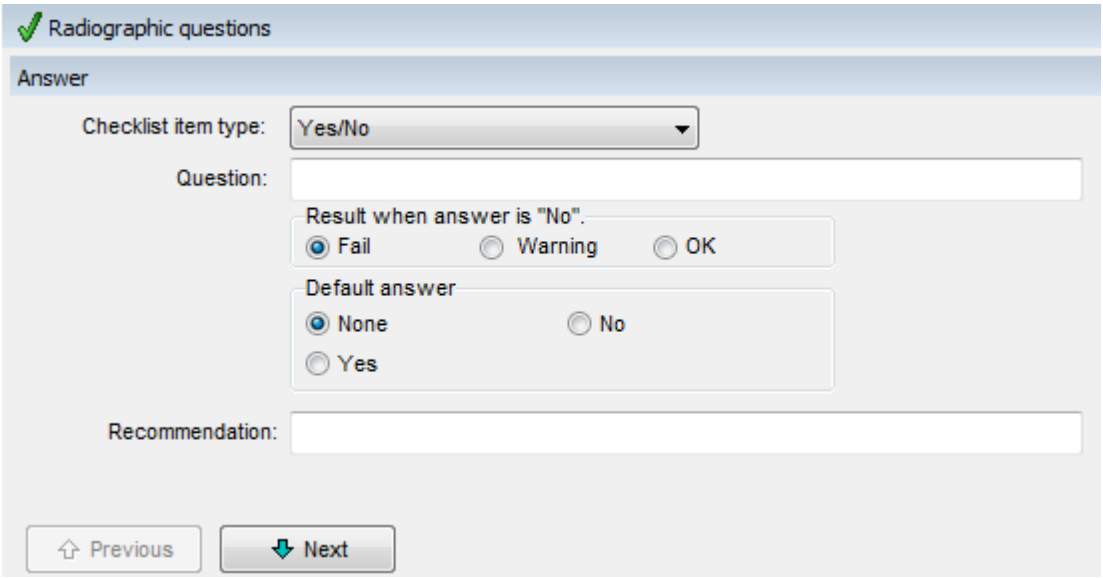
4. The next page you come to looks like the picture below. This is where you select how many rows you want in this checklist template. There must be a row accounted for every question you want to add to the checklist template. It is possible to add/delete rows even after the checklist has been created. For our example, we'll choose six rows and then click Finish to end the wizard and create the grid.



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5. This would be a good place to save our work so click Save, give your new template a name so it will be saved in the Library. The next step is to create our questions and headings.

6. The window below is the next window you will come to after you saved your work. This is where we'll enter our questions and headings that will be shown in the grid when we use this template.



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If you refer to the grid at the beginning of our example, we have two sets of questions divided by headings. You would use headings to group similar questions together. Let's enter the first heading called "Operator Protection".

7. To enter the heading, you will see "Checklist item type:" at the top of the window with a drop-down

list. Click on the drop-down list, and choose the "Heading" option.

8. Type "OPERATOR PROTECTION" in the "heading" field then click Next to continue.

9. The next step is to add the two questions that go under this heading. In our example, all of our questions will be Yes/No question, however there are other types of questions available to you. To read more about the other question types and how to use them, read the Different types of checklist items topic.

10. We will now add the first question. In our grid at the beginning of this example, the first question is the "Exposure switch mounted properly?" question. To add this question, go to the "Checklist item type:" at the top of the page, then choose the "Yes/No" question option from the drop-down list.

11. Type "Exposure switch mounted properly?" in the "question" field. You can also add the pass/fail criteria by clicking on the appropriate radio buttons, and add a recommendation in the "Recommendation" field. This recommendation will be shown when this question fails.

12. Finish adding the rest of the questions and the heading the same way we described above, then click Save after you filled in all six rows to save your work.

13. If you want to see how your questions work, you can, while in Design mode, enter some or all of the answers you have chosen to see if the checklist behaves the way you want it to. These answers will not be saved, since you are in Design mode, but it enables you to make adjustments to your template before you start using it in the field.

Other adjustments you may consider making at this time are to:

- Modify column widths to fit your needs (and fit on the paper when you print out the report)
- Change column headings
- Add hints
- Add supporting information

How to to add a hint is described here...

How to add supporting information to the test is described here...

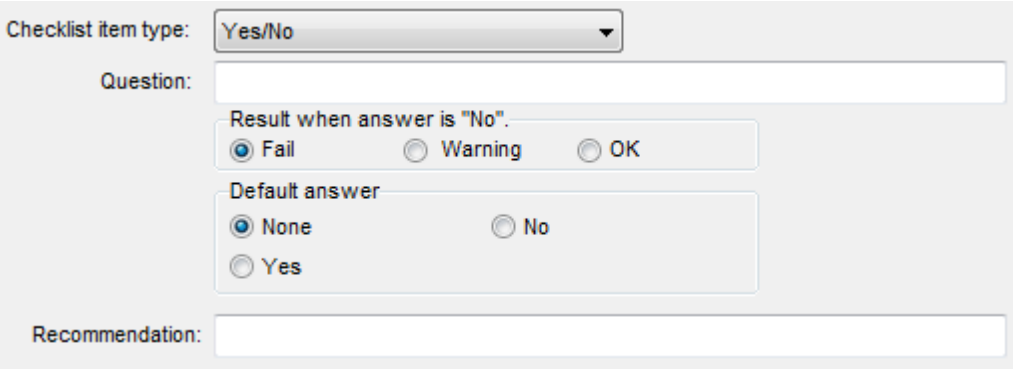
3.2.2.2.2 Different type of checklist items

You can choose from six types of questions when you design a checklist template. They are listed below:

Yes/No question: provides two options; "Yes" or "No".
Yes/No/N.A. question: provides three options; "Yes", "No" or "N.A."
Heading: insert a heading in the checklist
Text: the answer is a text
Number: the answer is numeric
User defined question: provides up to six user-defined options

3.2.2.2.2.1 Yes/No question

This window is shown when you want to add a question with a pass/fail value of Yes/No value.



Click to compress

Question: type the question text here

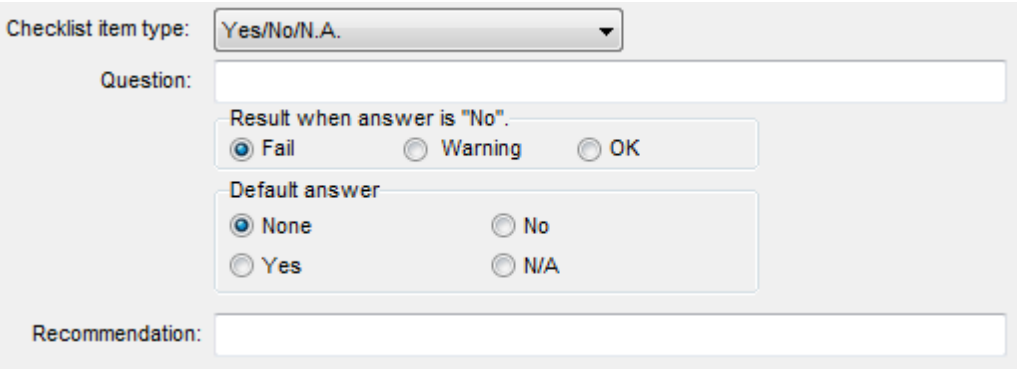
Result when answer is "No": specify if a "No" answer is fail, pass or a warning

Default answer: If you want a default answer requiring the user to answer with a single click only, then you can just select the appropriate radio button for the default answer. If no default answer is provided, the user must always answer "Yes" or "No" and then click Next to go to the next question.

Recommendation: the text you type here is shown automatically if you answered "Fail" or "Warning" to a question

3.2.2.2.2.2 Yes/No/N.A. question

This window is shown when you want to add a question with a pass/fail value of Yes/No/N.A. value.



Click to compress

Question: type the question text here

Result when answer is "No": specify if a "No" answer is fail, pass or a warning

Default answer: If you want a default answer requiring the user to answer with a single click only, then you can just select the appropriate radio button for the default answer. If no default answer is provided, the user must always answer "Yes" or "No" and then click Next to go to the next question.

Recommendation: the text you type here is shown automatically if you answered "Fail" or "Warning" to a question

3.2.2.2.2.3 Heading

This window is shown when you want to add a heading to identify different groups of questions.



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Heading: type the heading text here

3.2.2.2.2.4 Text

This window is shown when you want to add a question with a pass/fail text value.

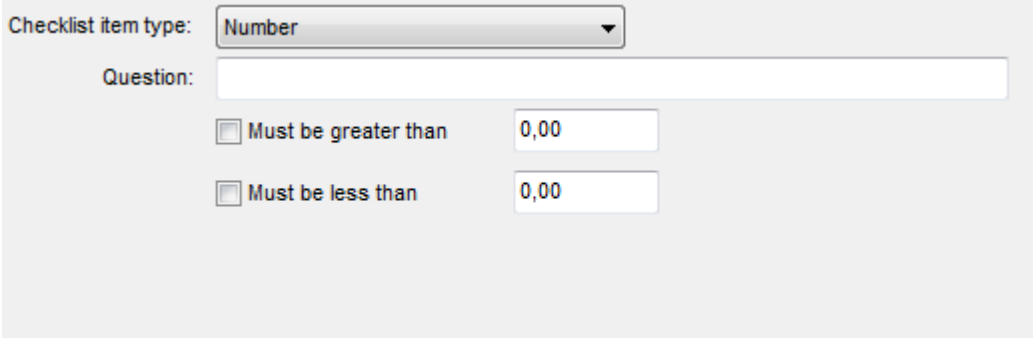


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Question: type the question text here

3.2.2.2.2.5 Number

This window is shown when you want to add a question with a pass/fail numerical value.



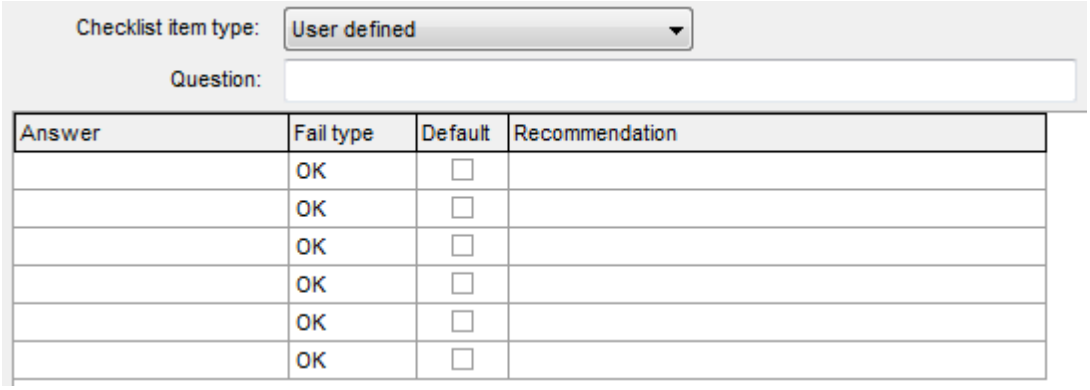
Click to compress

Question: type the question text here

Must be greater than: Lowest allowed value (optional)

Must be less than: Highest allowed value (optional)

3.2.2.2.2.6 User defined



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This checklist item type enables you to cerate your own question with up to six possible answers. Radio buttons will be used to offer a simple and quick way to answer the user-defined questions. You can choose "Fail", "OK" or "Warning" definition for each answer.

Question: type the question text here

Answer: type the answer text here

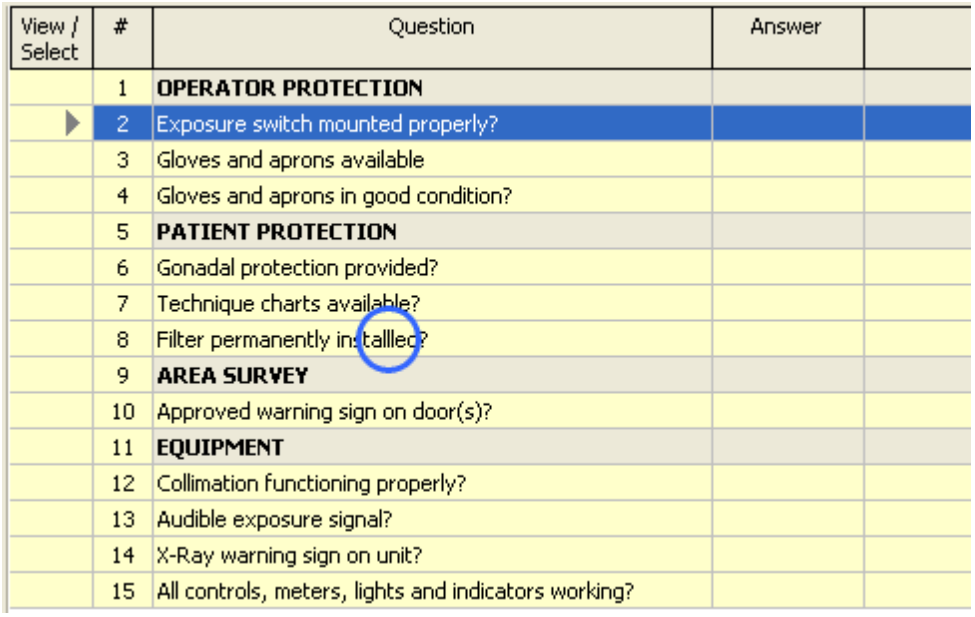
Fail type: this is a pull-down menu, you can select between "OK", "Fail", "Warning"

Default: you can chose one to be the default answer

Recommendation: the text you type here is shown automatically if "Fail" or "Warning" is indicated

3.2.2.2.3 Modify a question

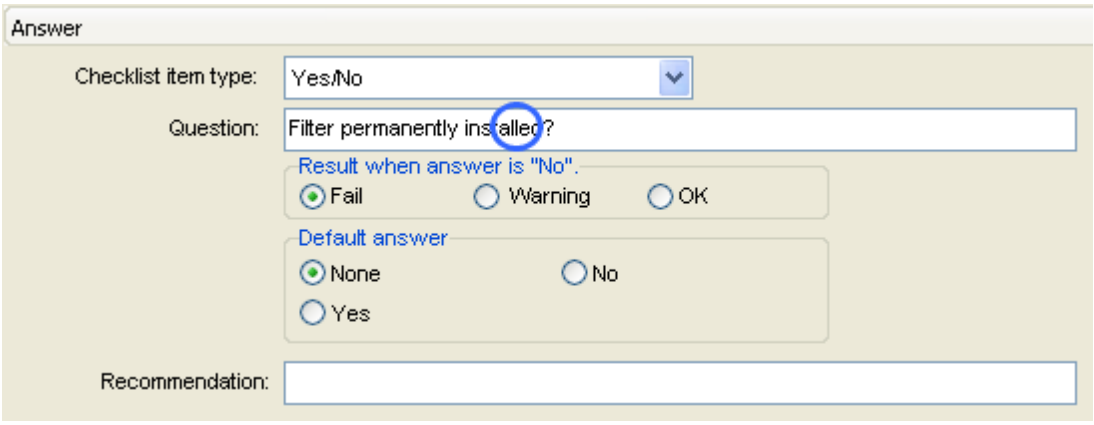
In this example, we will show how to modify a question. Let's assume that we discovered a spelling error in a question and want to correct it. Follow the steps below:



Click to compress

1. Go to the Design page on the ribbon bar and click the "Edit question" button.
2. Select the row with the spelling error by clicking in the left column (View/Select).
3. Correct the question text in the question edit window. The question edit window looks like the

picture below.



Click to compress

4. Quit edit mode by clicking on the Close button or click on the "Edit question" button again.

3.2.2.2.4 Add/delete rows

You add/delete rows in checklist templates the same way as you add/delete rows in a test template. Learn more by reading how to add/delete rows in test templates.

3.2.2.2.5 Hints

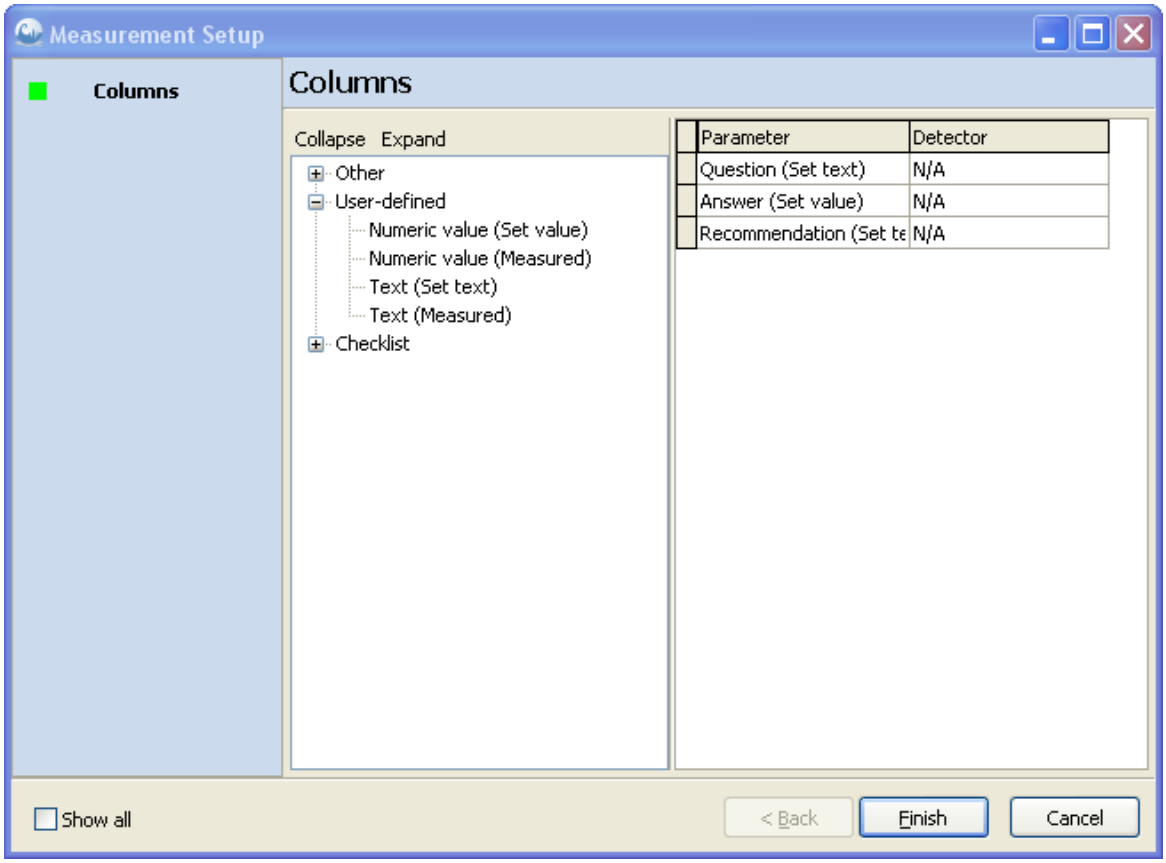
Hints can be attached to checklists templates the same way as to test templates. Learn more by reading how to add hints to test templates.

3.2.2.2.6 Add/delete columns

It is possible to add or delete columns in a checklist. The following instructions will tell you how:

1. Before you can proceed with adding and deleting checklist columns, you must have a checklist template open or a checklist you have already completed open. Right-click outside the grid on the empty space to the right or below the grid to access the drop-down menu and select "Modify checklist". You can also go to the Design page on the ribbon bar and select Modify from the Test/Checklist group to achieve the same result.

2. A wizard will pop up next, showing the columns on the left and the parameters on the right (see picture below):



Click to compress

To add a column: Use drag-and-drop to select a column on the left side and drop it on the right side. You can also double-click on columns on the left side to select them.

To delete a column: Right-click on a column on the right side, select Delete from the menu. You can also select a column from the right side by clicking on it and then press the Delete on the keyboard to achieve the same result.

Note: The Question and Answer columns cannot be removed.

3. When the checklist template is to your liking, click the Finish button to close the wizard.

As soon as the wizard finishes, the changes you made are now visible in the checklist template.

3.2.2.2.7 Add/delete analysis

A checklist analysis is available to you. It basically reports if the checklist passed or failed. If you choose to use this analysis, you can see how many questions passed, as well as how many warnings there were. The default layout for the checklist analysis is described in the topic Checklist.

We will show you how to use a checklist analysis to create a certain result. Let's assume that you have a checklist divided into several different sections (see the picture below):

View / Select	#	Question	Answer	Recommendation
	1	**OPERATOR PROTECTION**		
▶	2	Exposure switch mounted properly?		
	3	Gloves and aprons available		
	4	Gloves and aprons in good condition?		
	5	**PATIENT PROTECTION**		
	6	Gonadal protection provided?		
	7	Technique charts available?		
	8	Filter permanently installed?		
	9	**AREA SURVEY**		
	10	Approved warning sign on door(s)?		
	11	**EQUIPMENT**		
	12	Collimation functioning properly?		
	13	Audible exposure signal?		
	14	X-Ray warning sign on unit?		
	15	All controls, meters, lights and indicators working?		

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If you just assign an analysis to the checklist (it is the same procedure as for test templates), the result looks like this:

Analysis

Summary
Checklist: FAIL

Checklist

Result: FAIL

Total of 1 question(s) failed.
There were 0 warning(s).

However, if you want something a bit more creative, you can use several checklist analyses to show the results of each section. It can then look like this:

Analysis

Summary
Operator protection: Pass
Patient protection: FAIL
Area survey: Pass
Equipment: Pass
Complete cheklist: FAIL

Total of 1 question(s) failed.
There were 0 warning(s).

We used five checklist analyses to create the above result. Four were assigned to the rows in each section respectively, and the last one is covering all rows to give the overall result. The layout has been modified to create appearance of the above picture.

An analysis is deleted from the checklist the same way as an analysis is deleted from a test template.

3.2.2.2.8 Report

There are some things you can do to a test template that will affect on how it appears in the report:

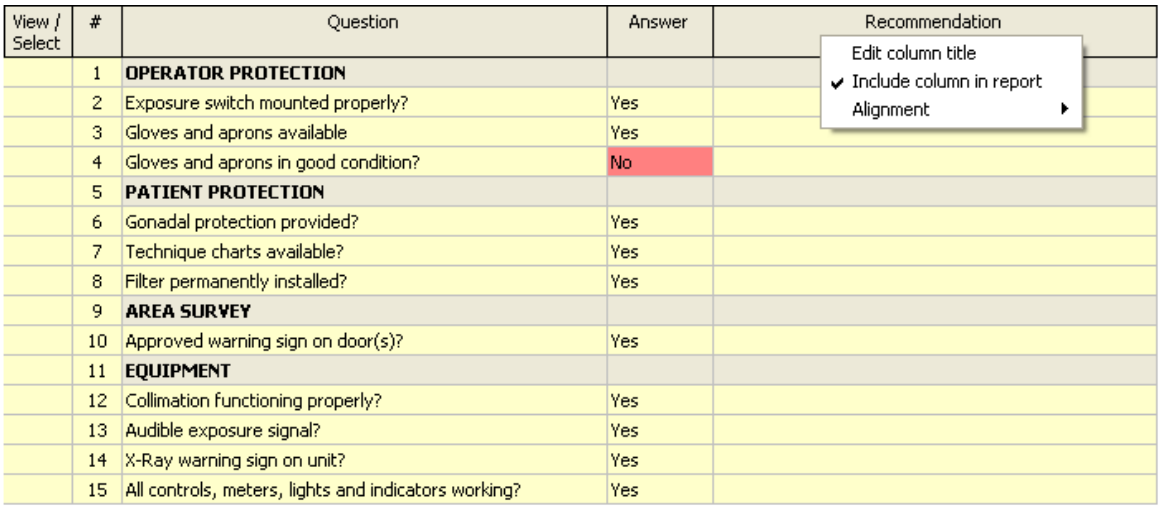
- Exclude columns from the report
- Change the width of columns

Exclude columns from the report

All columns will be included in the report by default. You can exclude columns if you like. Excluding columns is especially useful if you find you have a problem fitting the entire grid on a page. It is also useful to exclude columns from the report if the columns are support information columns and not really part of the test.

To exclude/include columns from the report, follow the steps below:

1. Right-click on the column heading.



View / Select	#	Question	Answer	Recommendation
	1	**OPERATOR PROTECTION**		
	2	Exposure switch mounted properly?	Yes	
	3	Gloves and aprons available	Yes	
	4	Gloves and aprons in good condition?	No	
	5	**PATIENT PROTECTION**		
	6	Gonadal protection provided?	Yes	
	7	Technique charts available?	Yes	
	8	Filter permanently installed?	Yes	
	9	**AREA SURVEY**		
	10	Approved warning sign on door(s)?	Yes	
	11	**EQUIPMENT**		
	12	Collimation functioning properly?	Yes	
	13	Audible exposure signal?	Yes	
	14	X-Ray warning sign on unit?	Yes	
	15	All controls, meters, lights and indicators working?	Yes	

Click to compress

2. Uncheck or check "Include column in report" to exclude/include it in the report.

Change the width of columns

The width you give columns on the screen will be saved in the template and used when the test is printed in the report. Use drag-and-drop to modify the width of the columns.

3.2.2.3 Design a session template

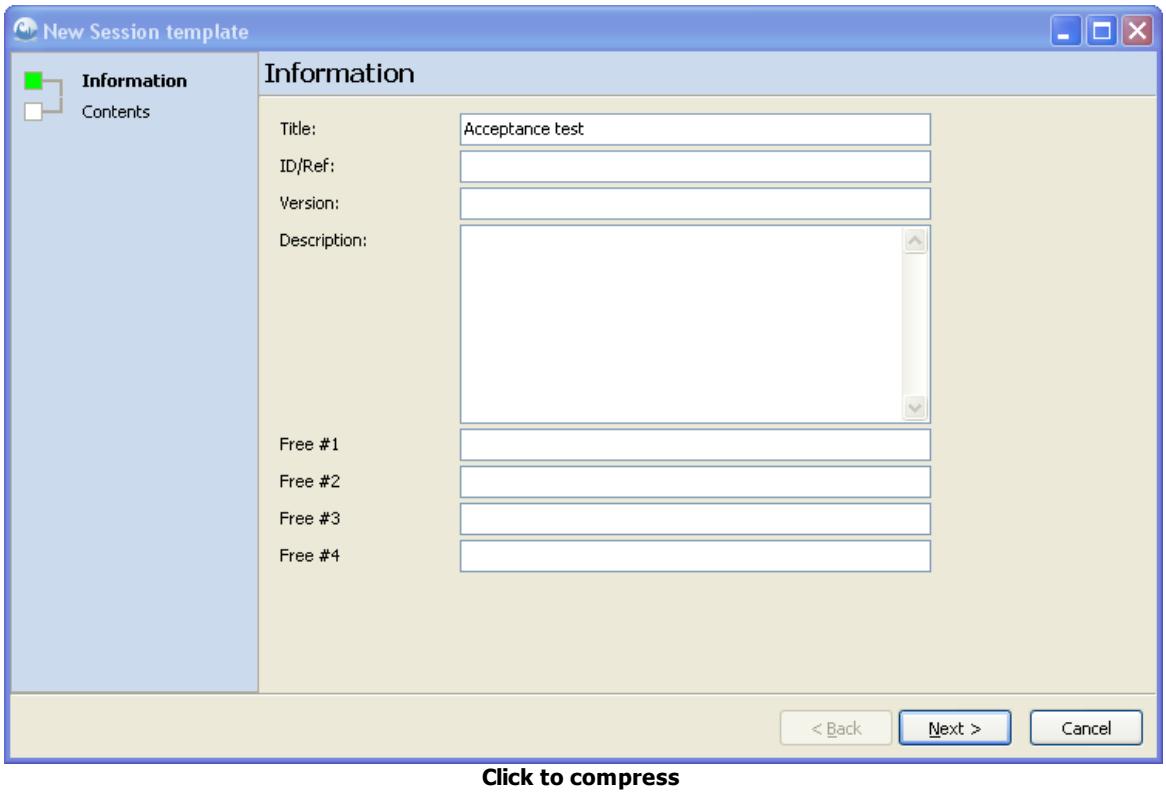
Ocean comes with a set of generic templates you can use in your testing, however, you can easily design your own session templates that may be more suitable for the type of work you do. A session template consists of one ore several test templates and checklist templates. A session template defines a complete job.

To design a session template involves the following steps:

1. Go to the Design page on the ribbon bar and select Session from the Template button.

2. The new session wizard will start and guide you through the process. You can now see at the bottom that Status bar #2 is indicating that you are designing a session template. The first thing you should enter is the title for the session.

The title will be used to identify this session and it will be the title of the report you generate when you use this session. It will also be used in various places in Ocean when you use this session template. The remaining fields are not used by Ocean, they are provided for optional use. None of these fields appear in the report.

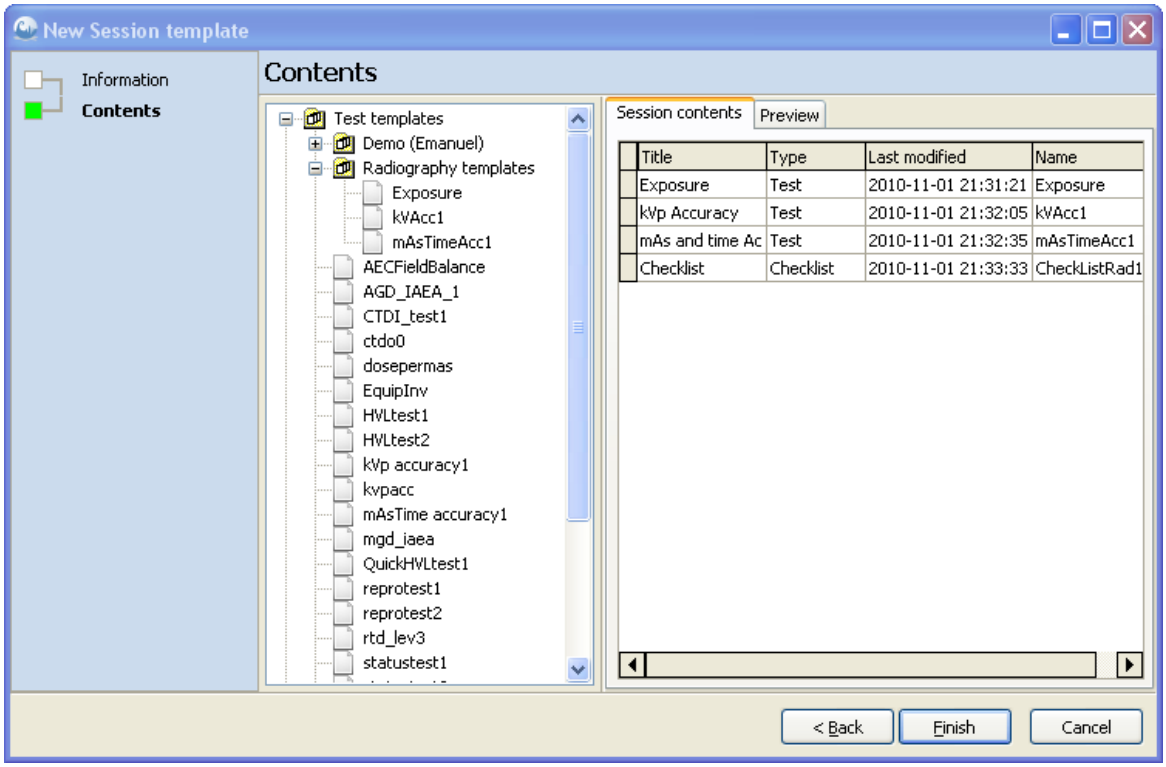


Click to compress

3. Choose a name for the session template then click Next to continue with the wizard.

4. The next window will look like the picture below, showing the possible test/checklist choices on the left side that you can include in your session template. You can use drag-and-drop or double-click to move templates from the left to the right side. The right side of the screen shows what will be included in your session template. If you want to remove something from the right side, select it and hit the Delete key on your keyboard. You can also change order of the included items by using drag-and-drop on the right side.

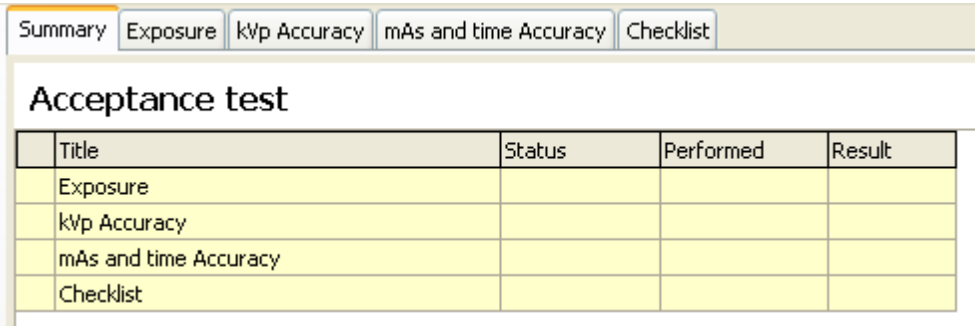
If you want to preview a template before adding it, select the Preview tab on the right side and then move the cursor above the items on the left side to view the content. Double-click when you want to select something.



Click to compress

5. Make your template selections, then click the Finish button to end the wizard and create the session template.

6. Once the session template is created, it looks like the picture below. The first page shown is the summary page that lists all the test/checklist templates included in this session template.



Click to compress

7. If you are satisfied with the contents, click the Save button to save it and it will be saved and can be viewed in the Library tab.

3.2.2.3.1 Add/delete test to a session

You can add to or delete test templates from a session at any time. There are several ways to do this. You can do this in "Data mode" and in "Design mode".

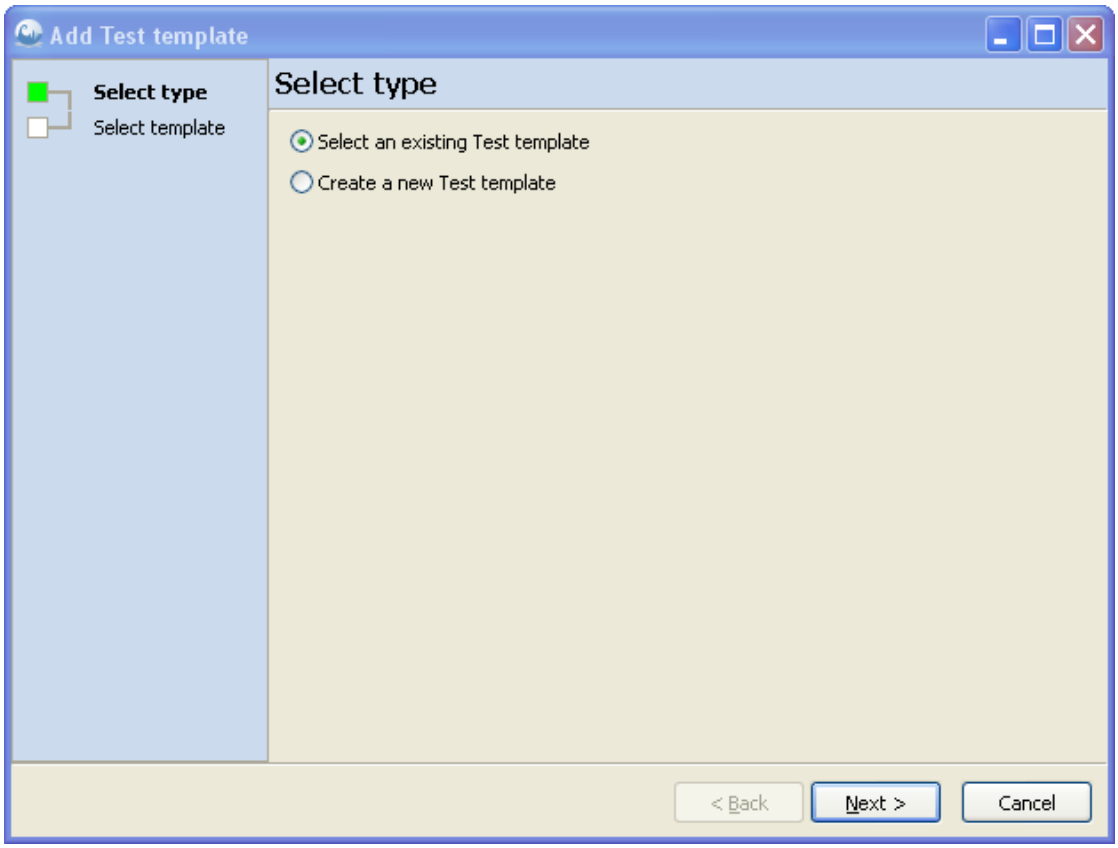
Use the button on the ribbon bar - add a test

The following example will show how to add a test template to a session. Before you can add a test template, you must have a session template loaded (Design mode) or an active session assigned to a room (Data mode). Follow the steps below to add a test template:

1. Select the "Design" page on the ribbon bar.

2. Click the "Modify session" button.

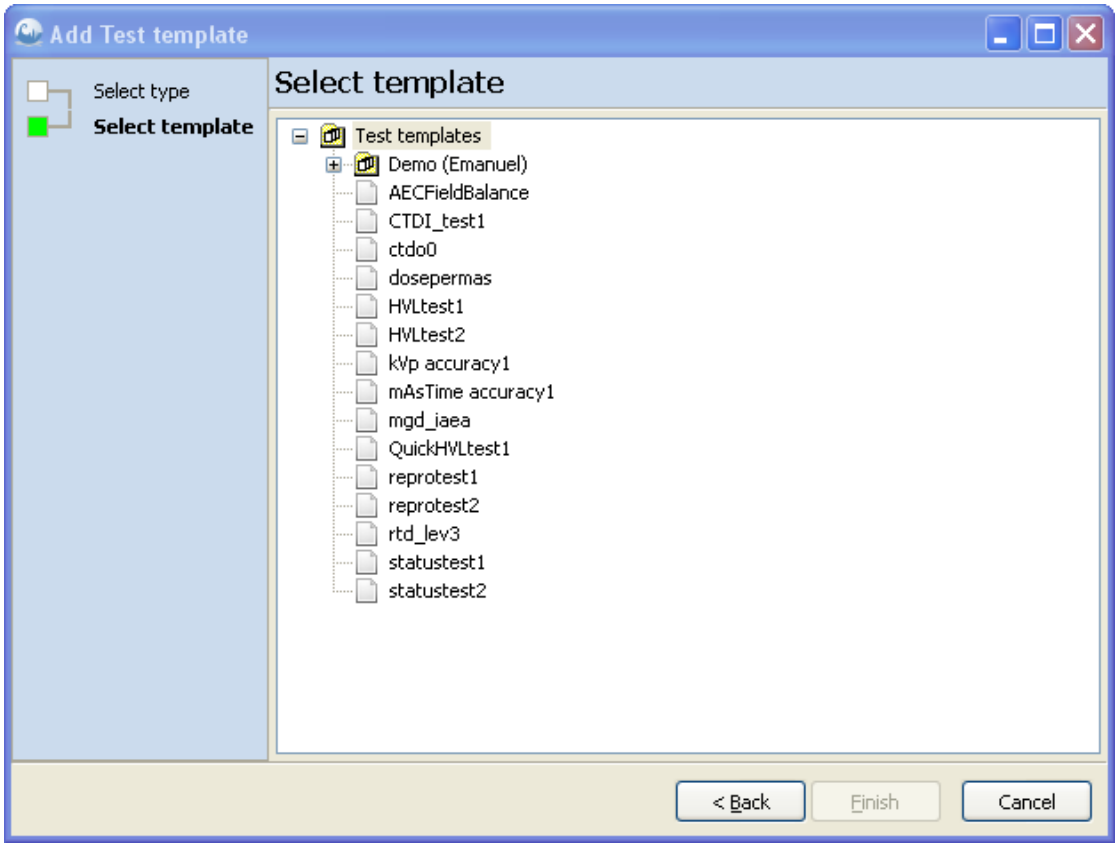
3. The session wizard will appear giving you the option to select an existing test template or create a new one (see picture below). For our example, we will choose to add an existing test template.



Click to compress

Choose the "Select an existing Test template" option, and click Next to continue with the wizard. Note: If you want to design a completely new test template, this wizard terminates and a new wizard starts that will guide your through the process. You can find the instructions on creating a test template from scratch here...

4. Your screen should look like this now, showing the available test templates to choose from. Select one from the list, then click Finish to end the wizard.



Click to compress

5. You will see your chosen test template added as the last item of the session.

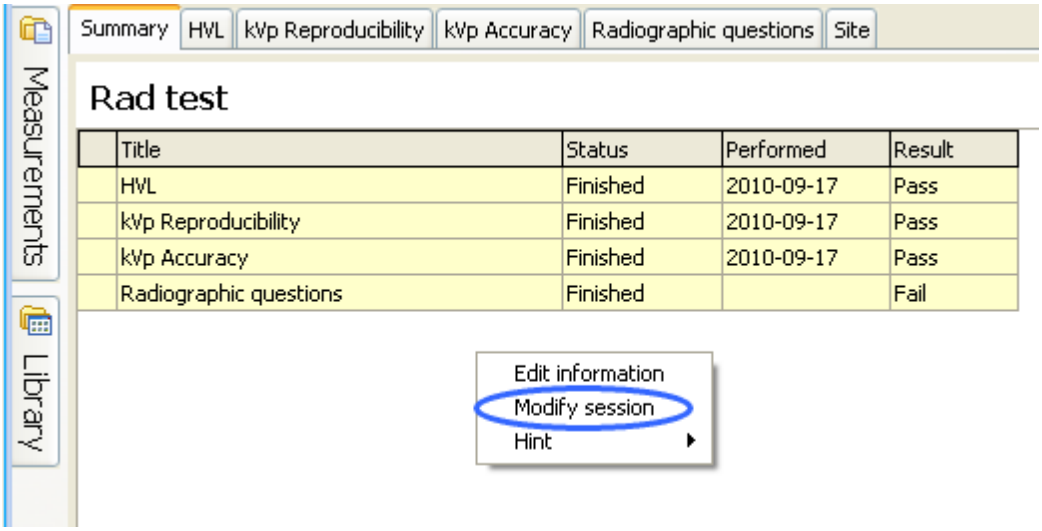
-End-

Use the right-click menu to modify session - Add, delete or change order of tests/checklists

A more flexible way do what we did in the above example is to use the right-click menu available for sessions:

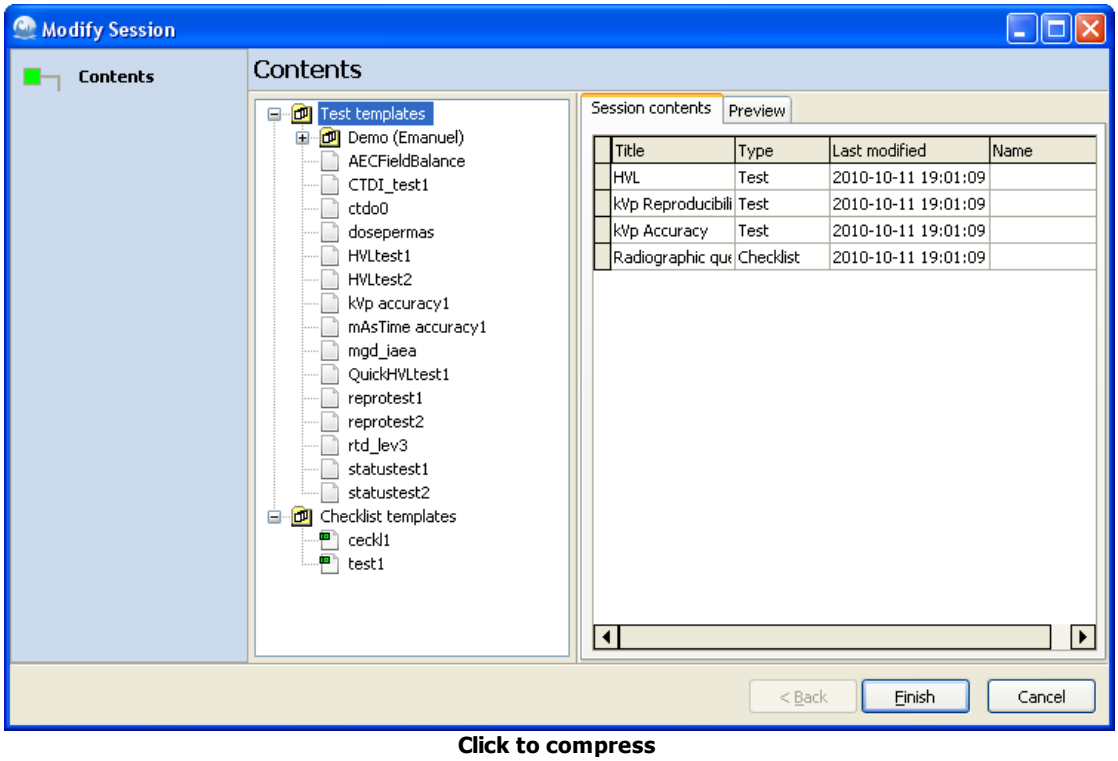
1. To access the right-click menu, go to the session summary page (see picture below) and right-click anywhere outside the session content list (the white background) and the menu will pop up.

2. Select the "Modify session" option to add, delete or change the order of tests/checklists in a session.



Click to compress

3. The following dialogue box will appear after you selected to modify a session showing what is in the session currently (the right side of the screen) and what you can add (left side of the screen). You can double-click on any test or checklist template on the left side of the screen to add it to the session. If you want to delete a template from the session, click on the item you want to delete, then press the Delete key on your keyboard.



Click to compress

Note: Any template you add to a session will always be listed as the last item in the session. If you wish to change the order of the templates in your session, you can use drag-and-drop to change the order.

4. When you have finished modifying your template, click Finish to end the wizard.

-End-

3.2.2.3.2 Add/delete checklist to session

You can add to or delete checklists from a session at any time. There are several ways to do this. You can do this in "Data mode" and in "Design mode".

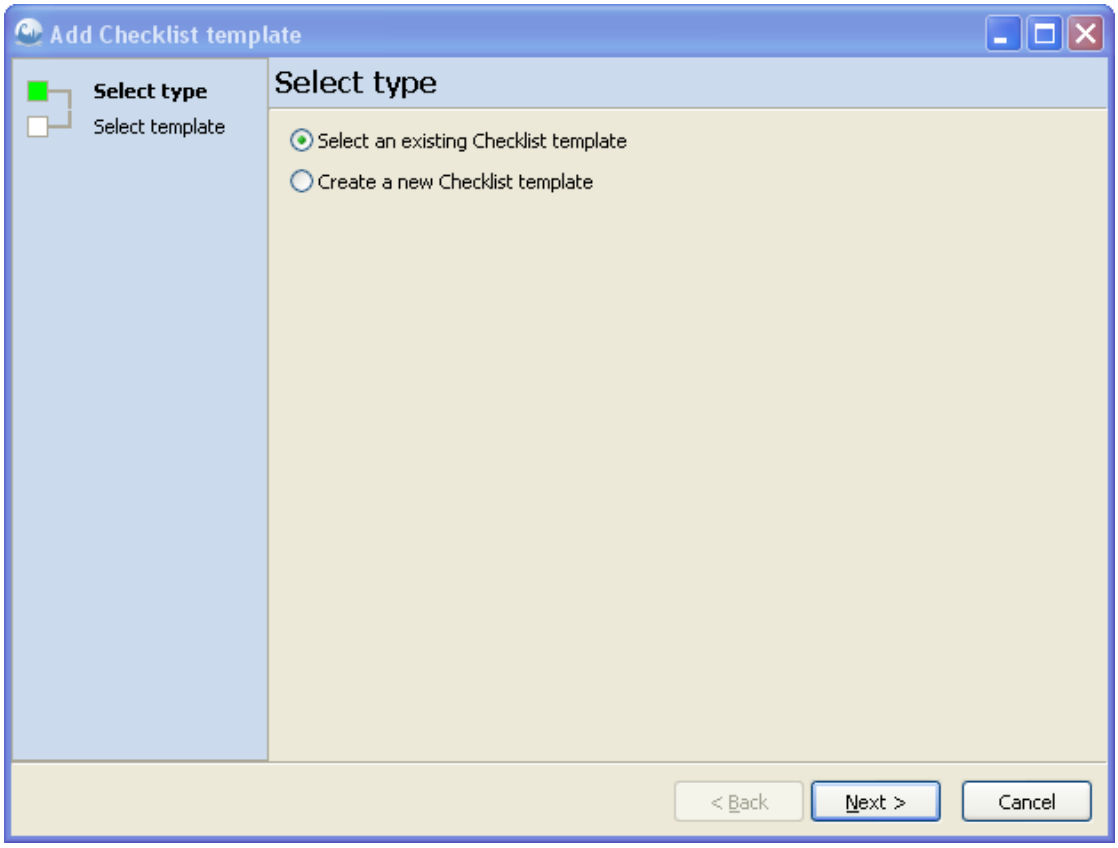
Use the button on the ribbon bar - add a checklist

The following example will show how to add a checklist to a session. Before you can add a checklist, you must have a session template loaded (Design mode) or an active session assigned to a room (Data mode). Follow the steps below to add a checklist:

1. Select the "Design" page on the ribbon bar.

2. Click the "Add checklist" button.

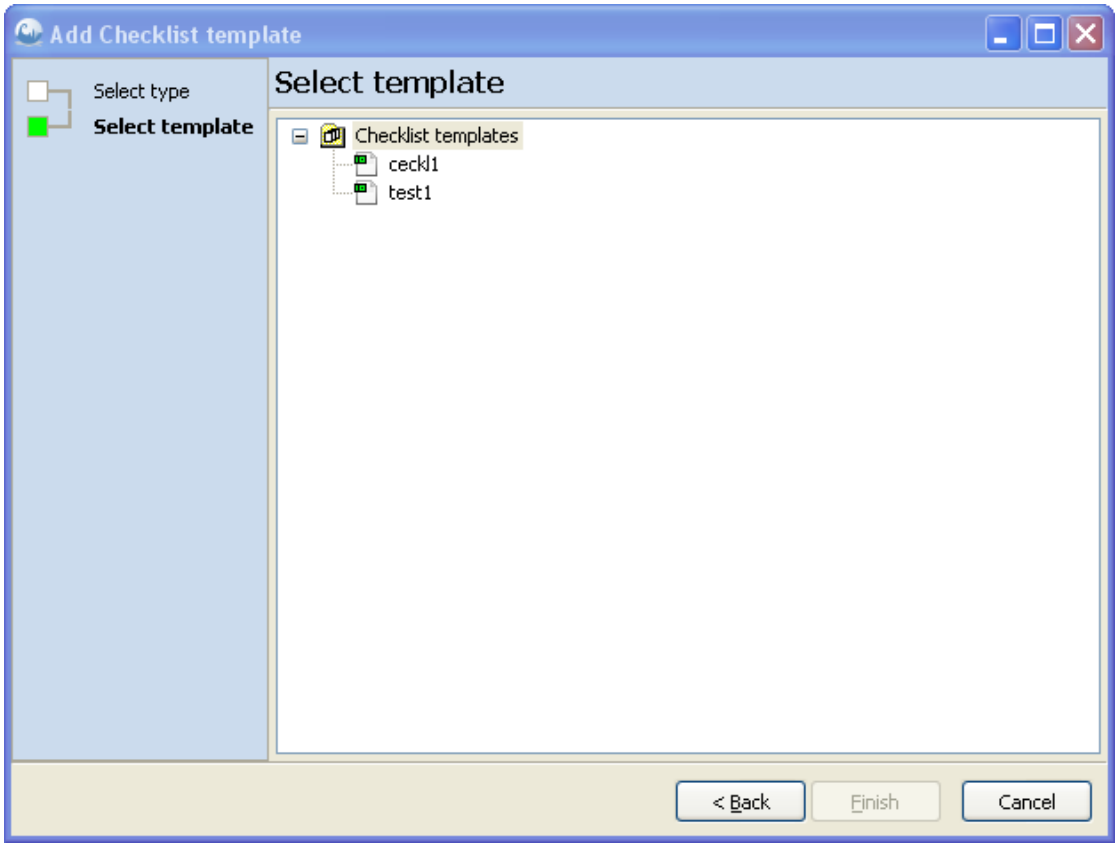
3. The checklist wizard will appear giving you the option to select an existing checklist template or create a new one (see picture below). For our example, we will choose to add an existing checklist template.



Click to compress

Choose the "Select an existing Checklist template" option, and click Next to continue with the wizard. Note: If you want to design a completely new checklist, this wizard terminates and a new wizard starts that will guide your through the process. You can find the instructions on creating a checklist from scratch here...

4. Your screen should look like this now, showing the available checklist templates to choose from. Select one from the list, then click Finish to end the wizard.



Click to compress

5. You will see your chosen checklist added as the last item of the session.

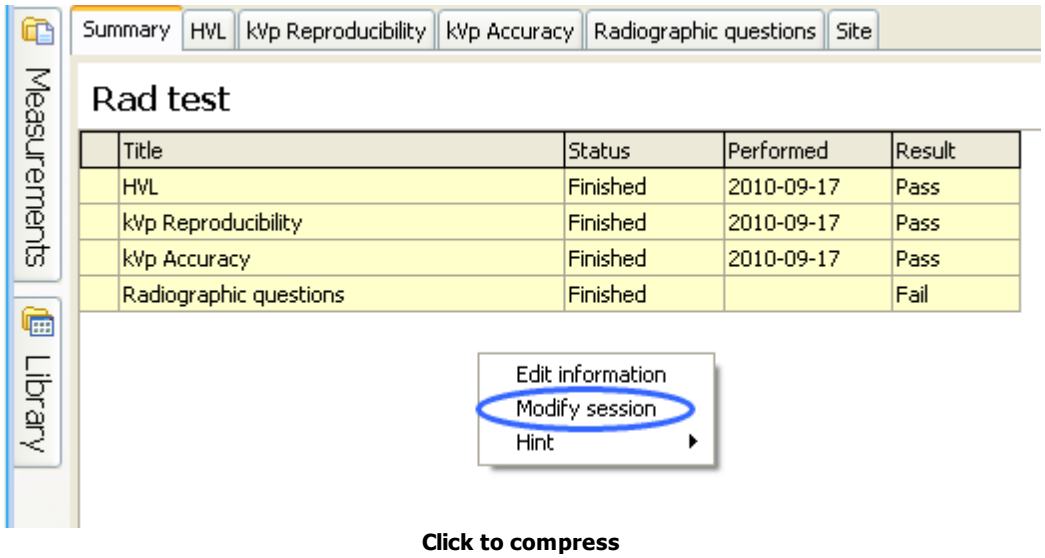
-End-

Use the right-click menu to modify session - Add, delete or change order of tests/checklists

A more flexible way do what we did in the above example is to use the right-click menu available for sessions:

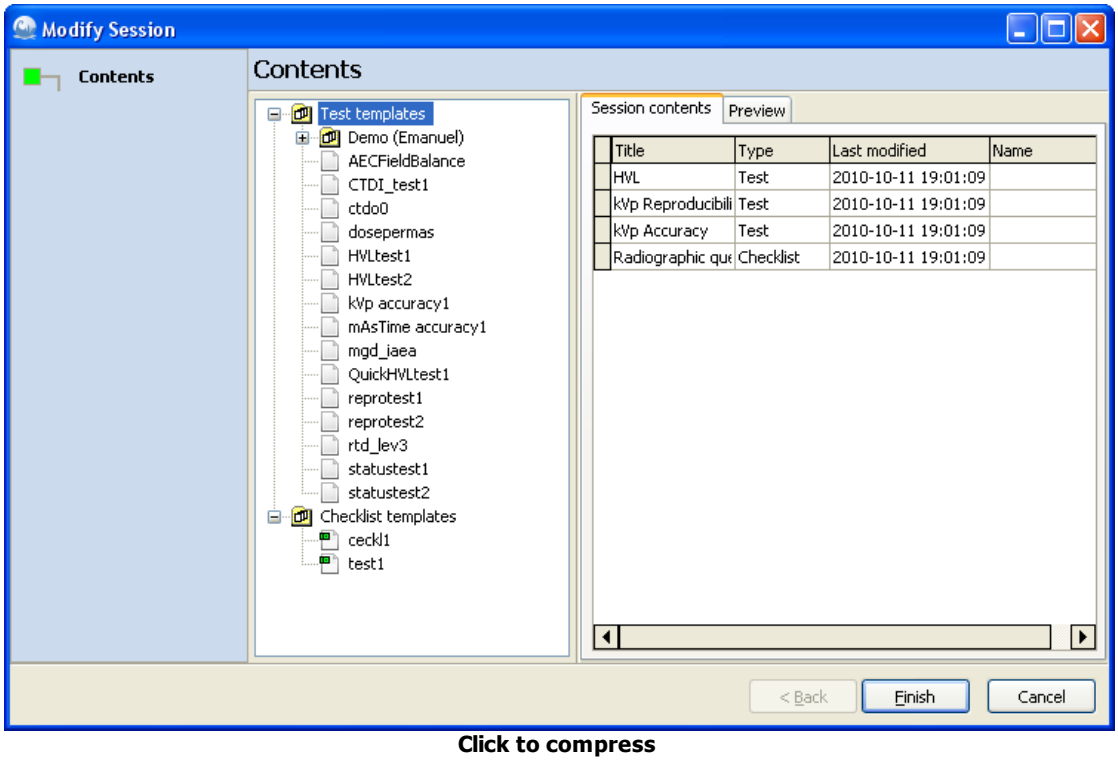
1. To access the right-click menu, go to the session summary page (see picture below) and right-click anywhere outside the session content list (the white background) and the menu will pop up.

2. Select the "Modify session" option to add, delete or change the order of tests/checklists in a session.



Click to compress

3. The following dialogue box will appear after you selected to modify a session showing what is in the session currently (the right side of the screen) and what you can add (left side of the screen). You can double-click on any test or checklist template on the left side of the screen to add it to the session. If you want to delete a template from the session, click on the item you want to delete, then press the Delete key on your keyboard.



Click to compress

Note: Any template you add to a session will always be listed as the last item in the session. If you wish to change the order of the templates in your session, you can use drag-and-drop to change the order.

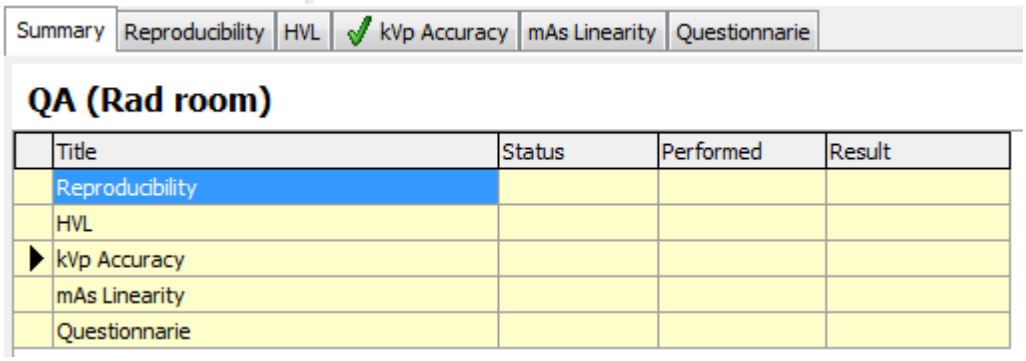
4. When you have finished modifying your template, click Finish to end the wizard.

-End-

3.2.2.3.3 Hide tests or checklists

Sometimes you may not want to do all tests or checklists that is in a session. You don't want to delete them from your session template since you use them at other occasions, you just want to hide them. This is possible to do in the following way:

1. Assume that the summary page looks like this. You have four tests and a checklist.

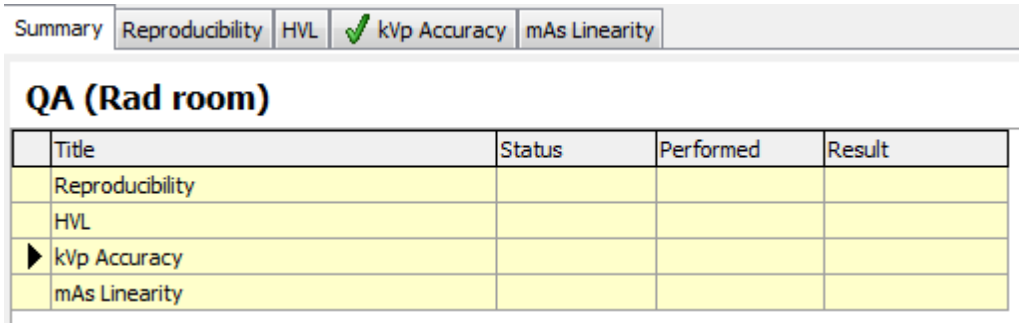


Click to compress

2. Assume that you want to skip the Questionnaire.

3. Right-click on the last row in the summary and select **Hide** from the menu.

4. The checklist is now hidden.

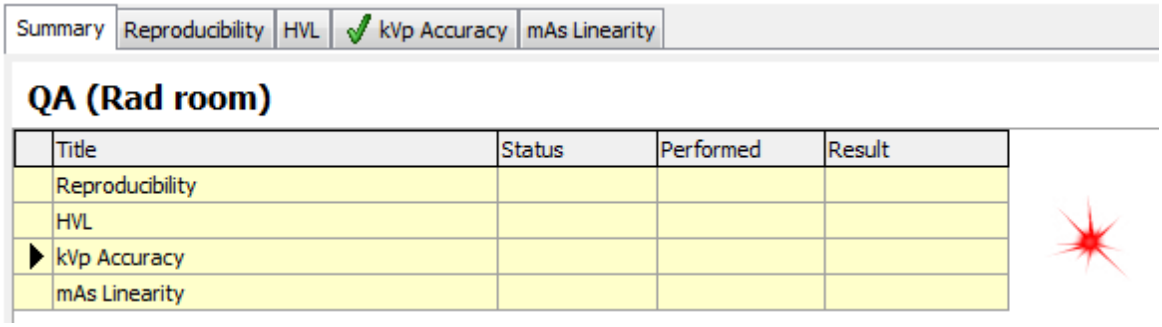


Click to compress

Hidden tests or checklist are still in the session but not available and they will not appear anywhere.

To restore a hidden test or checklist:

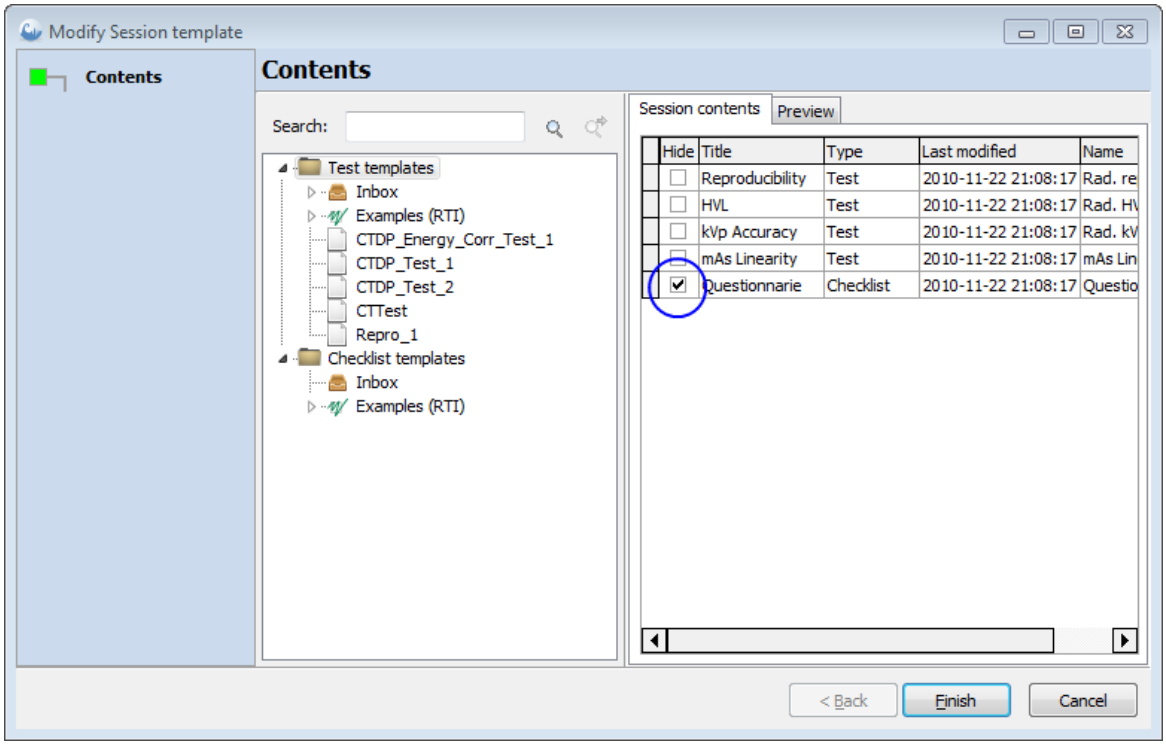
1. Right-click outside the grid.



Click to compress

2. Select **Modify session** from the menu.

3. The Modify session template wizard is started.



Click to compress

4. Uncheck the checked item to restore it.

You can also use this function to hide items.

3.2.2.3.4 Select report layout

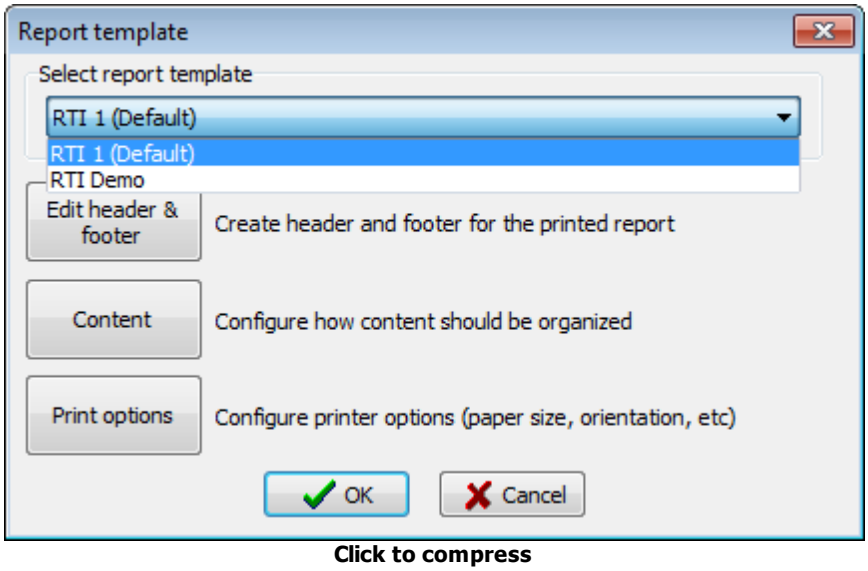
Beskriv hur man väljer. Hänvisa frammåt till avsnitet som beskiver hur man gör en egen Reprot template.

You select a layout for the report print-out and store it in the session template:

1. Go to the Reporting page on the ribbon bar.



2. Click on the **Report layout**. A dialogue is shown:



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3. The default layout is already selected automatically, you can now:

- change to another layout from the drop down list
- make local changes to this session template by clicking on the **Edit header&Footer**, **Content** or **Print options button**.

If you do local changes, these changes are only affecting the current session.

3.2.2.4 Supporting documentation

You can attach supporting documentation to a session template, to a test/checklist template and to an real-time display template.

We define supporting documentation as:

- Attached PDF files, MS Word files or any other file that can be opened on the computer, or
- Links to web pages

Attached documents are embedded into the object (template) it is attached to. Be careful if you attach large documents since many copies may occur in the Ocean database if you use the template frequently.

You can attach information to your session two ways:

- To the session (summary page)
- To individual tests/checklists

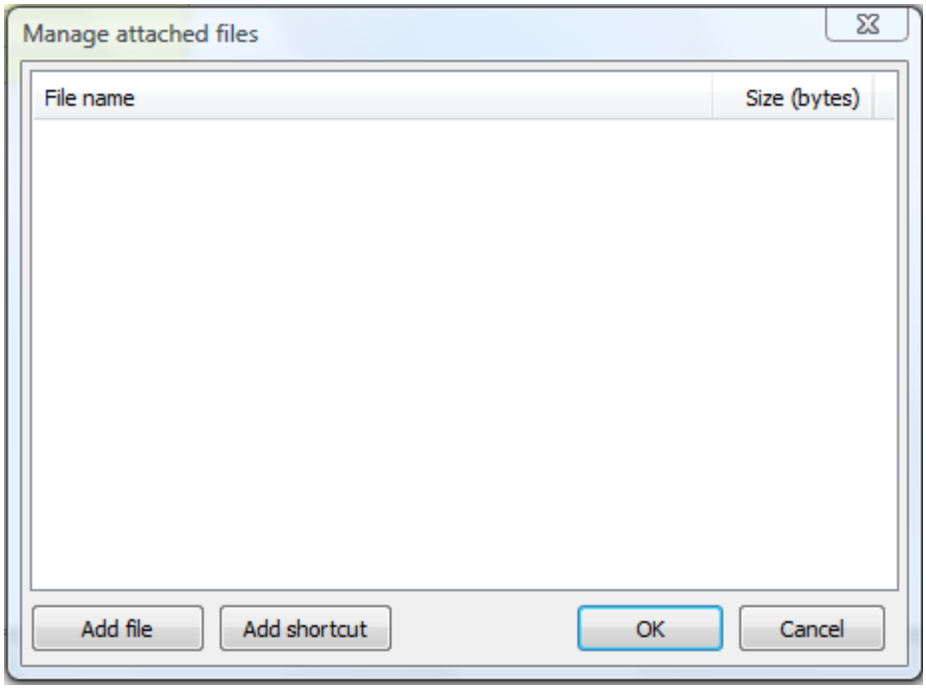
When you attach something to the session on the summary page, the information is accessible from all tests/checklists in the session. If you attach information to one of the tests/checklists, this information is only accessible when using the test/checklist to which the information was attached.

To add a supporting document to a session or a test/checklist, follow the instructions below:

1. If you are in design mode, click on the paper clip.



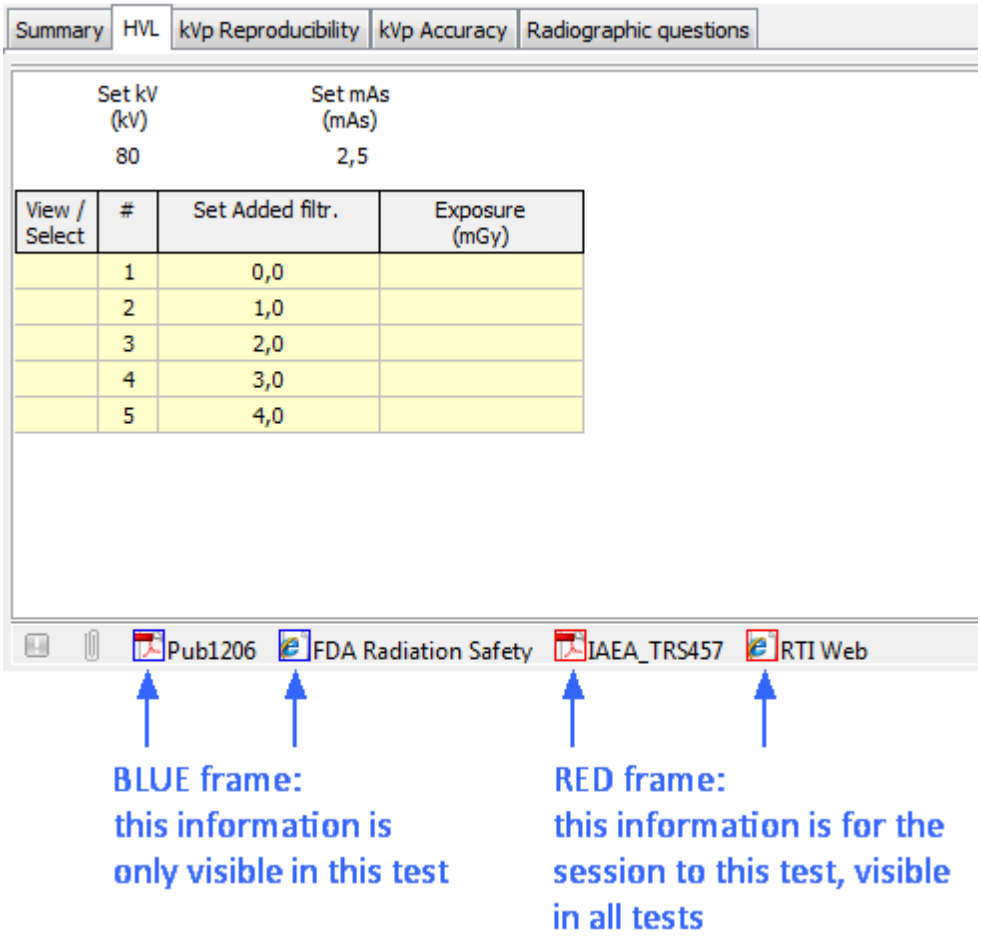
2. A dialogue such as the picture below will appear.



Click to compress

You can choose to add a file or add a shortcut. If you wish to add a supporting document to a session or test, click the "Add file" button, if you just want to refer to a website, click the "Add shortcut" button.

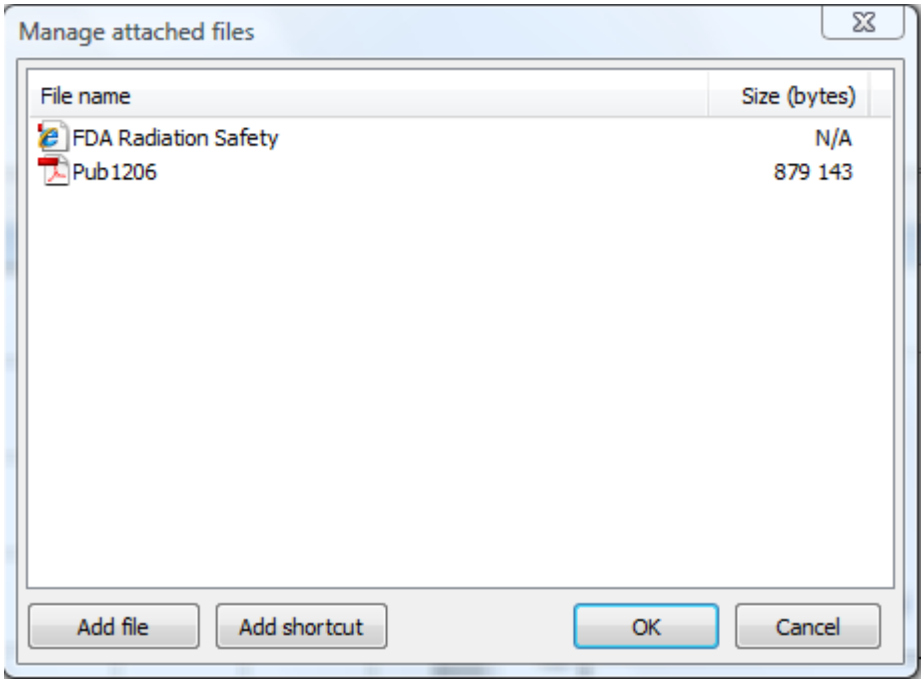
The attached information is shown the following way:



Click to compress

To delete attached information:

1. Click on the paper clip.
2. A dialogue will appear, showing all the attached information. Select the item you want to delete.



Click to compress

3. Press the "Delete" key on your keyboard.

3.2.2.5 Protection

It is possible to protect a session template from editing. The following things can be protected:

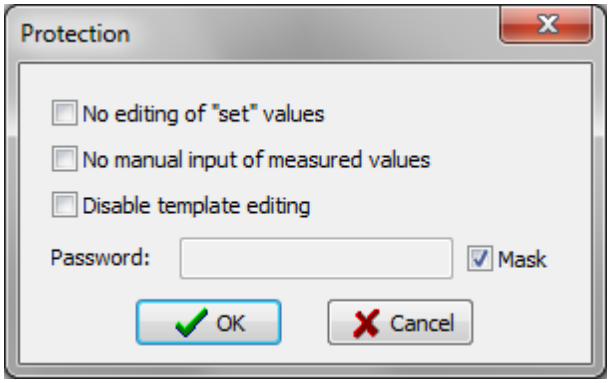
- Set values
- Measured values
- Template editing

If protected, a password is required to unlock to allow modification.

To protect a session or real-time display template:

1. Click on the Protection button on the ribbon bar.

2. A dialogue is shown:



Click to compress

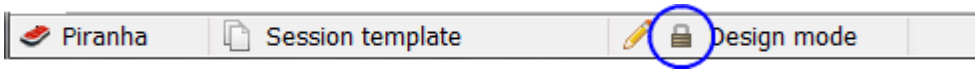
3. Select what you want to protect.

4. Specify a password.

NOTE! Make sure that you know the password. If you must have the password if you later want to modify the template.

5. Click on OK to finish.

6. The template is now protected. This is indicated on the status bar at the bottom of the screen:



Click to compress

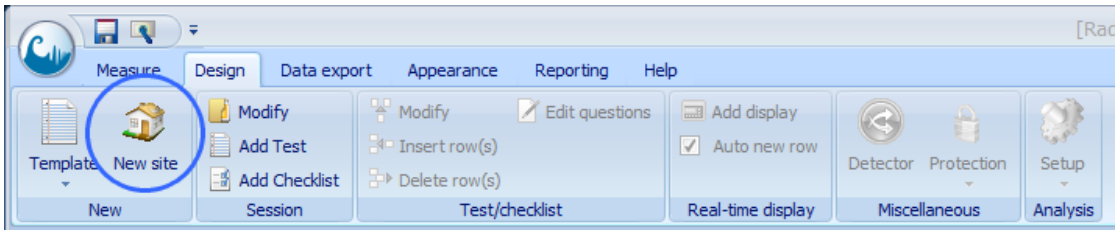
3.2.3 New Site

If you wish to add a new site, you can use the "New site" button on the ribbon bar (a wizard will guide you through the process) or do it by adding items directly in the database tree.

Create a new site

New site - use a wizard to create a new site

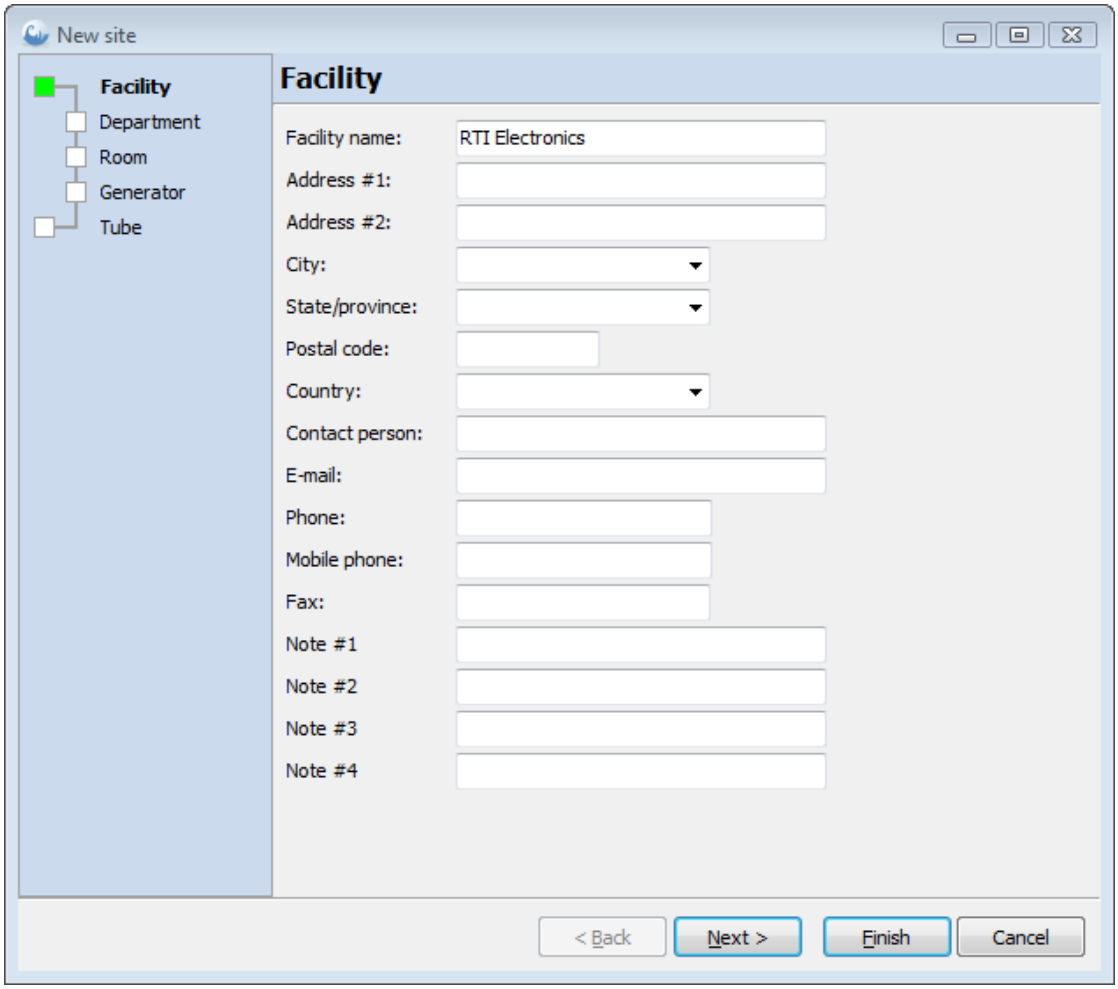
To use the wizard click on the "New site" button on the ribbon bar:



Click to compress

The wizard starts:

1. The first step is to add the facility information. You must add at least a facility name before proceeding further.

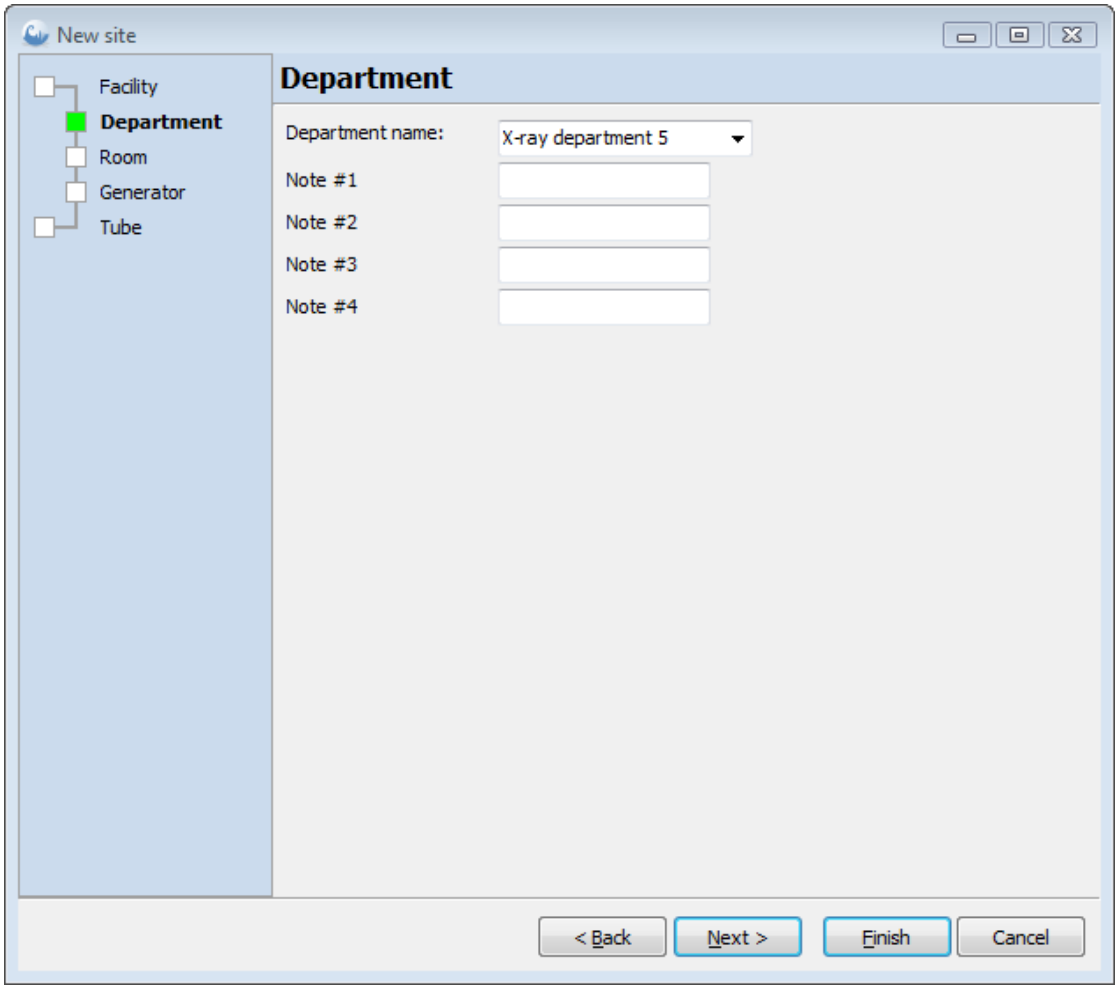


Click to compress

The fields "Note #1" ... "Note #4" are user-defined fields. You can go to Program options and setup the labels you want to have for these free fields.

2. When you have entered all the information, click Next to continue.

3. The second step is to add a department. You must enter at least a name for a department before proceeding further.

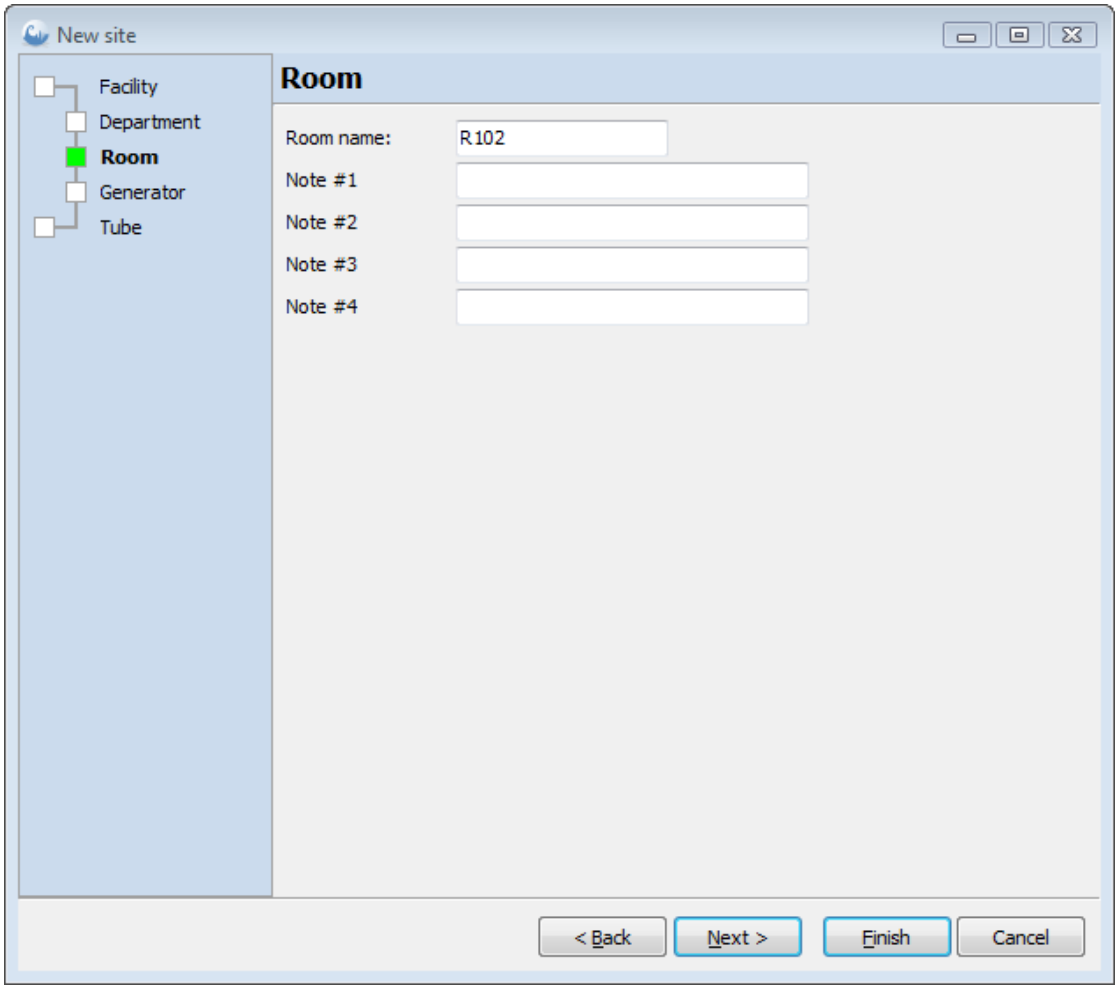


Click to compress

The fields "Note #1" ... "Note #4" are user-defined fields. You can go to Program options and setup the labels you want to have for these free fields.

4. When you are finished, click Next to continue with the wizard.

5. The third step is to add a room to your department. You must at least add a room name before proceeding further.

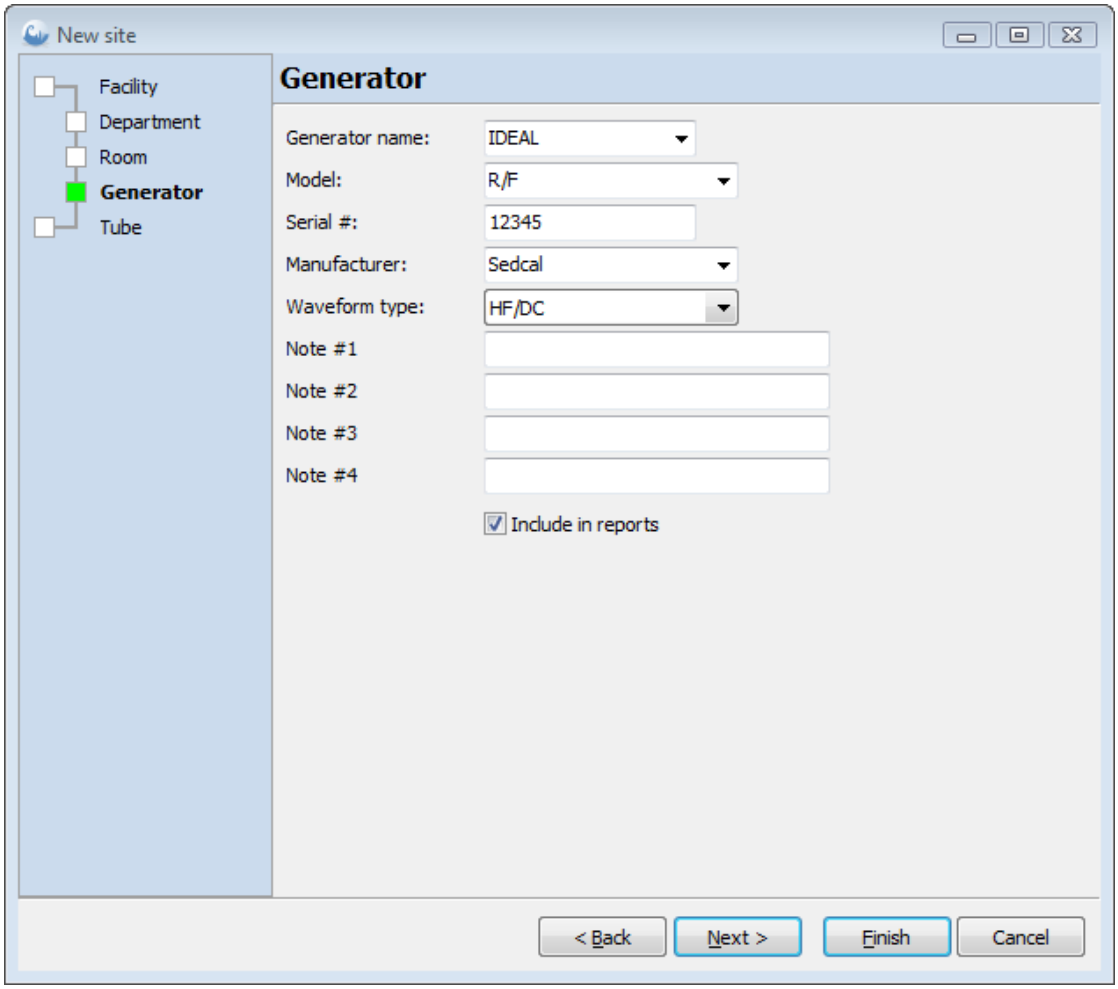


Click to compress

The fields "Note #1" ... "Note #4" are user-defined fields. You can go to Program options and setup the labels you want to have for these free fields.

6. Click Next when you are done, to continue with the wizard.

7. The next step is to add a generator to your room.

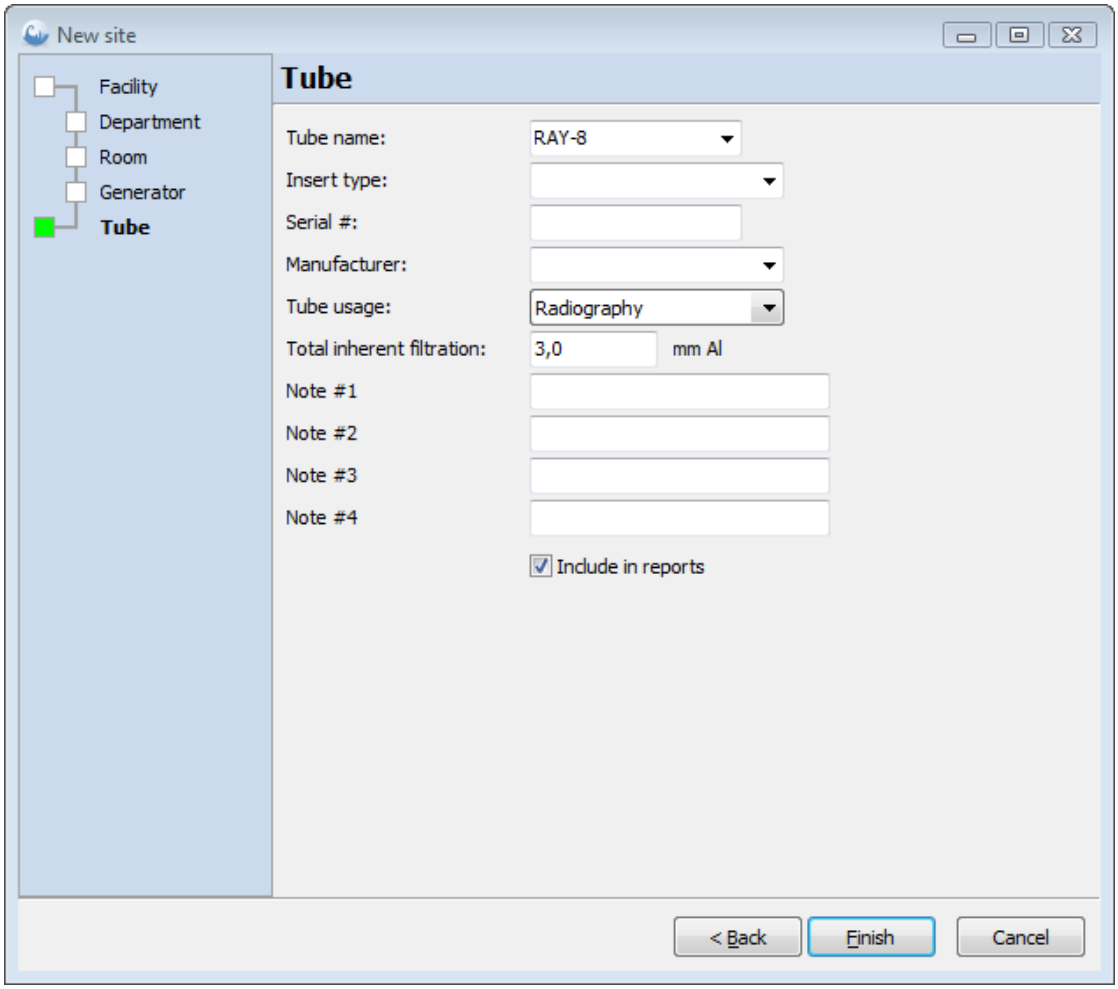


Click to compress

Enter the generator name and additional information. **Make sure that you select the correct waveform type for your generator.** If you don't know the waveform type, use the default value (HF/DC). The fields "Note #1" ... "Note #4" are user-defined fields. If you don't want the generator information shown in the report, "uncheck" the check box.

8. Click Next when you are done to continue with the wizard.

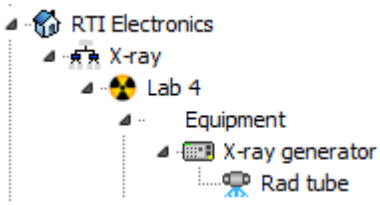
9. Before you can do any work in this room, you must add a tube.



Click to compress

Enter the tube name and additional information. **Make sure that you enter the correct "Tube usage" and "Total inherent filtration" (for Rad/CT/Dental tubes) or "Equivalent thickness for compression plate" (for Mammo tubes)**. If you don't know these values, use the defaults. The fields "Note #1" ... "Note #4" are user-defined fields. If you don't want the tube information shown in the report, "uncheck" the check box.

10. When you are done, click the Finish button to terminate the wizard. The information you have just entered is created in the database tree and shown as follows:



The equipment folder now contains a generator with a tube. You can add more tubes to the same generator, add more generators and add user-defined equipment.

You can edit the site information directly on the Measurements tab or use the Site information edit function.

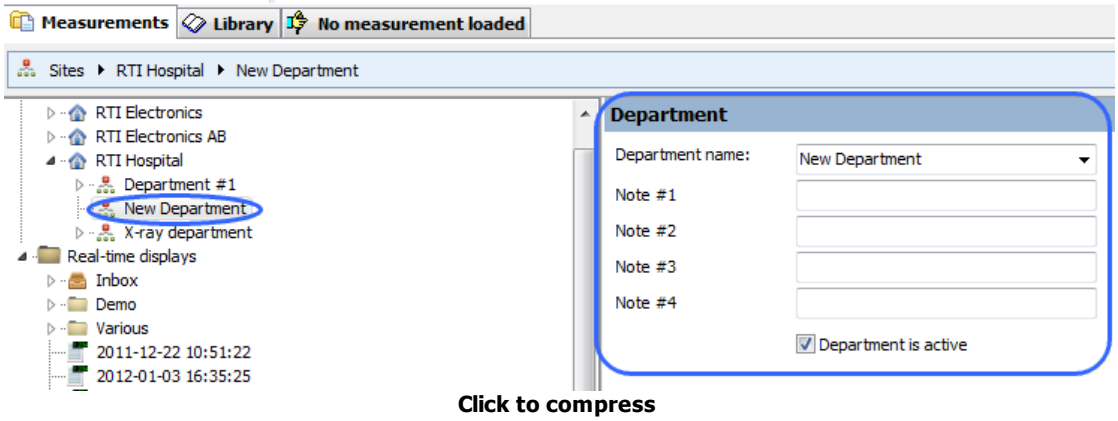
-End-

Add more departments and rooms

You can add more departments and/or rooms to any site you have in your database. The example below shows how to add a department, but adding a room is done the same way:

To add a department:

1. Open the Measurements tab.
2. Right-click on the facility you want to add a department to.
3. Select "Add department" from the menu.
4. A new department is created in the database. It is called "New department".

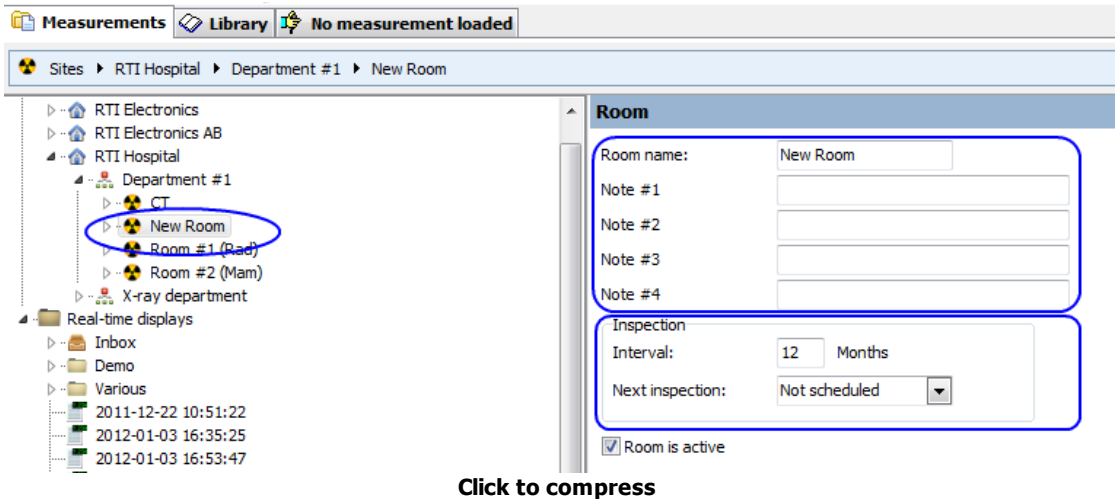


Click to compress

5. You can edit directly and complete the information in the right part of the Measurement tab.
6. Enter the information you want. The information is saved as you type it, so no save is needed.

To add a room

1. Right-click on the department you want to add a room to.
2. Select "Add room" from the menu.
3. A new room is created in the database. It is called "New room".



Click to compress

4. You can edit directly in the database tree or complete the information in the lower part of the Measurement tab.
5. Enter the information you want. The information is saved as you type it, so no save is needed.
6. It is an option to use the scheduling function that Ocean offers. If the fields "Interval" and "Next

inspection" is enabled this option is available (it may be disabled if Ocean Central is used). If you set a date, the task will come up in the To do list 14 days prior to the inspection date. The Scheduling function is enabled/disabled in the Program options.

-End-

Add more equipment

You can add more equipment (located in the Equipment folder in each room). You can add more generators, tubes or user-defined equipment. User-defined equipment can be any type of equipment (table, console, image intensifier, image receptor, and so on).

To add more equipment:

1. Right-click where you want to add more equipment. There are some rules you must follow:

- There is a maximum of three levels in the equipment tree.
- Generators can only be created in the Equipment folder "root".
- Tubes can only "belong" to a generator.
- User-defined equipment can be created on all three levels.

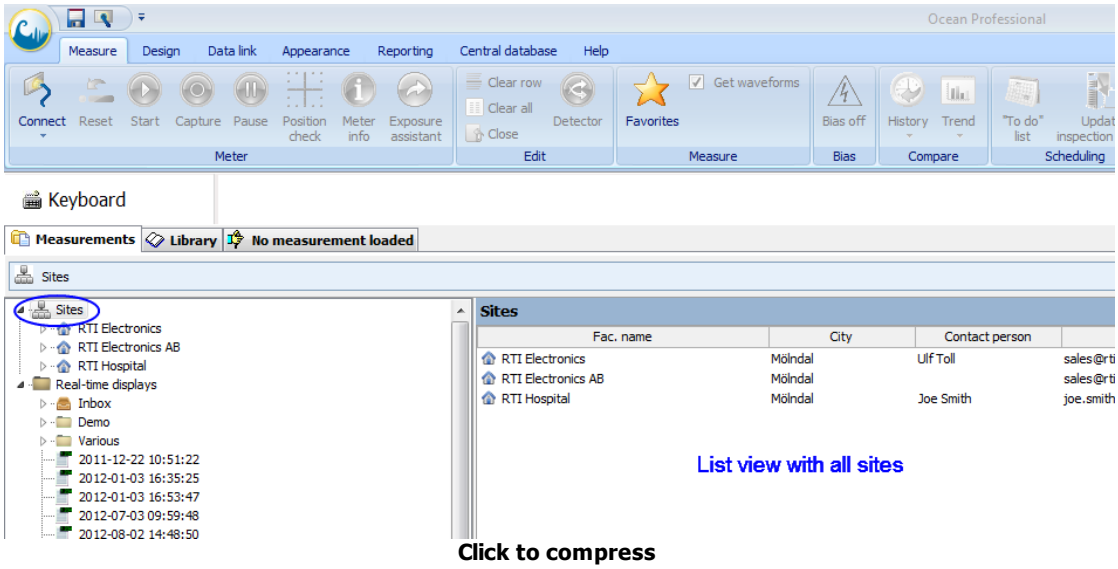
2. Select the equipment type you want to add from the menu.

3. Enter the necessary information about the equipment you want to add.

-End-

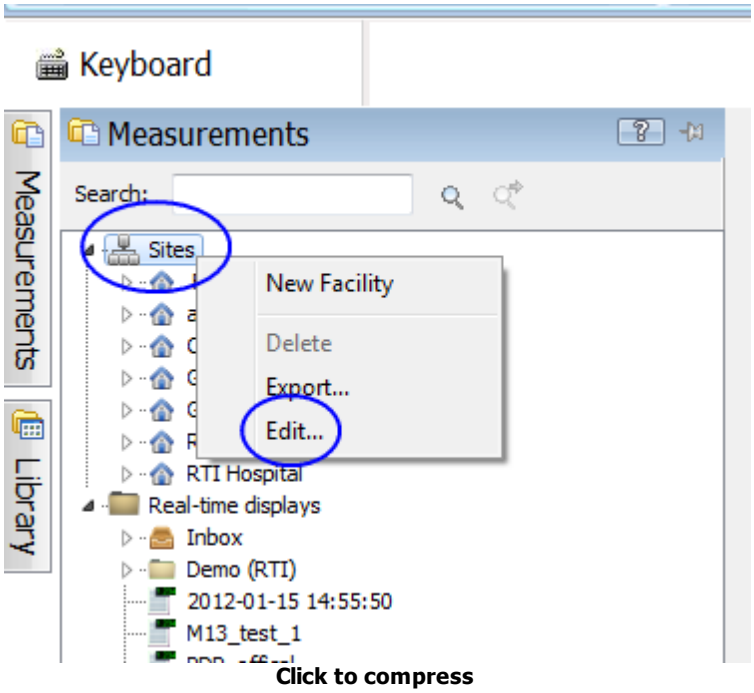
Edit site information

You can edit the site information in different ways. If you click on the top level Sites in the tree, a list view of all sites are shown to the right:



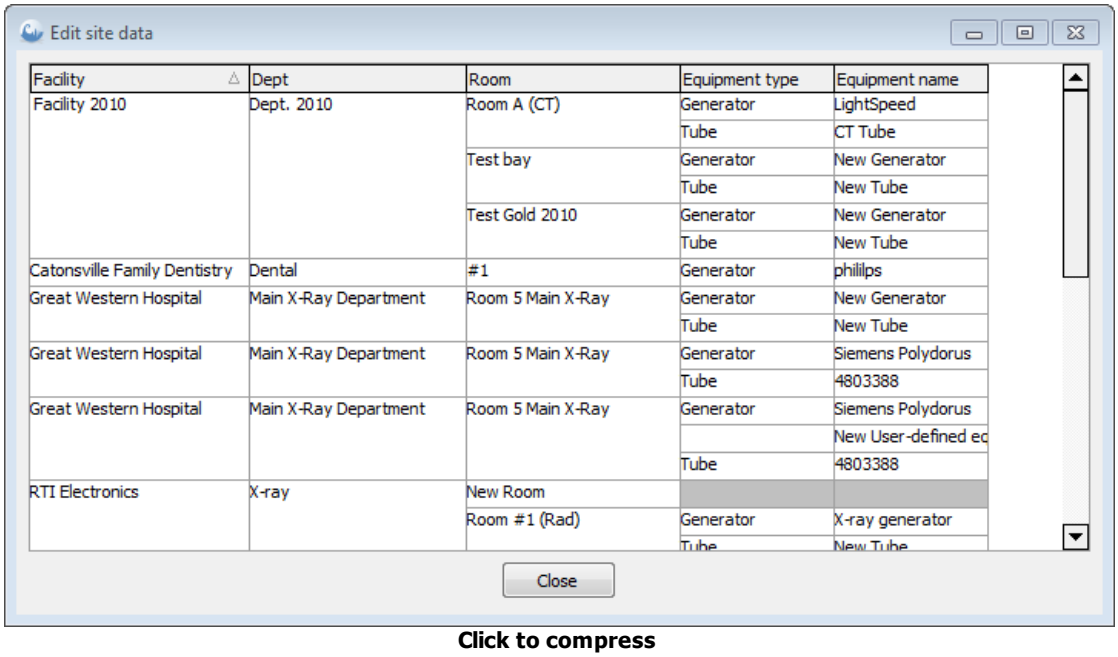
Click to compress

You can also edit site information and get an overview of all your sites by using a the "Edit..." function. It is available by right-clicking on "Sites" on the Measurements tab:



Click to compress

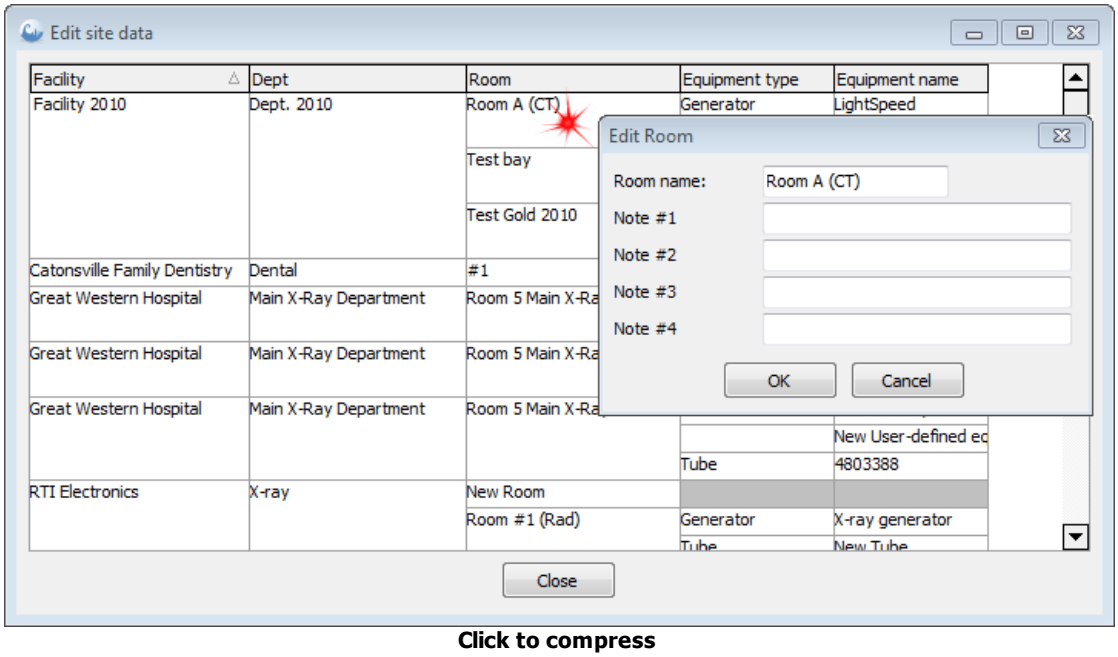
When you click on "Edit..." a window is opened that shows all your sites, departments, rooms and equipment:



Facility	Dept	Room	Equipment type	Equipment name
Facility 2010	Dept. 2010	Room A (CT)	Generator	LightSpeed
			Tube	CT Tube
		Test bay	Generator	New Generator
			Tube	New Tube
		Test Gold 2010	Generator	New Generator
			Tube	New Tube
Catonsville Family Dentistry	Dental	#1	Generator	phililps
Great Western Hospital	Main X-Ray Department	Room 5 Main X-Ray	Generator	New Generator
			Tube	New Tube
Great Western Hospital	Main X-Ray Department	Room 5 Main X-Ray	Generator	Siemens Polydorus
			Tube	4803388
Great Western Hospital	Main X-Ray Department	Room 5 Main X-Ray	Generator	Siemens Polydorus
				New User-defined ec
			Tube	4803388
RTI Electronics	X-ray	New Room		
		Room #1 (Rad)	Generator	X-ray generator
			Tube	New Tube

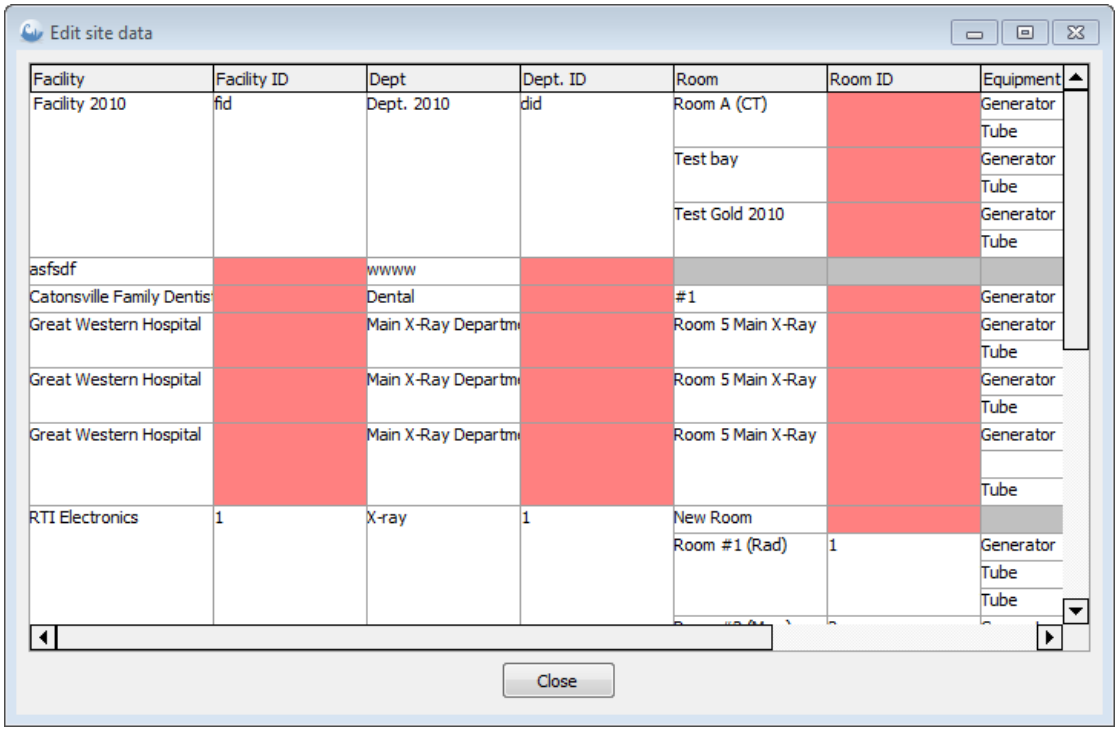
Click to compress

You can edit the site information by double-clicking on an item:



Click to compress

If you are using ID to identify your site information this function is useful when looking for missing ID numbers. If use of ID is enabled in the Program Options (or if you use Ocean Central) fields showing the ID strings are shown as well:



Click to compress

Fields with red background indicates that required ID are missing. You can double click and edit the ID field.

-End-

3.2.4 Design a real-time display

The procedure to design a real-time display is slightly different depending on each license level of Ocean has. We have listed the real-time display design abilities of each license level below.

Display

- Set up displays with measured data
- Data log showing measured data (you cannot repeat previously taken exposures, only view them)
- Waveforms
- Save templates that can be reused
- Print out your real-time display results

Connect

Connect does everything that Display does, plus the following:

- Data log with possibilities to go back and repeat previously taken exposures
- Templates can be saved with a number of pre-defined exposures (different meter settings)
- Links to Microsoft Excel and OpenOffice Calc

Professional

Professional does everything that Display and Connect do, plus the following:

- all column types are available
- analysis can be added

In the next page, we'll give you an example of a real-time display design that will work with all three Ocean license levels.

3.2.4.1 Set up displays

The first thing you should do when creating a new real-time display is to select what you want to measure. When you design a real-time display you can chose between having your meter connected to Ocean or work at your desk using the keyboard mode. There are advantages to both options but the final result and the function of your real-time display will be the same in both cases.

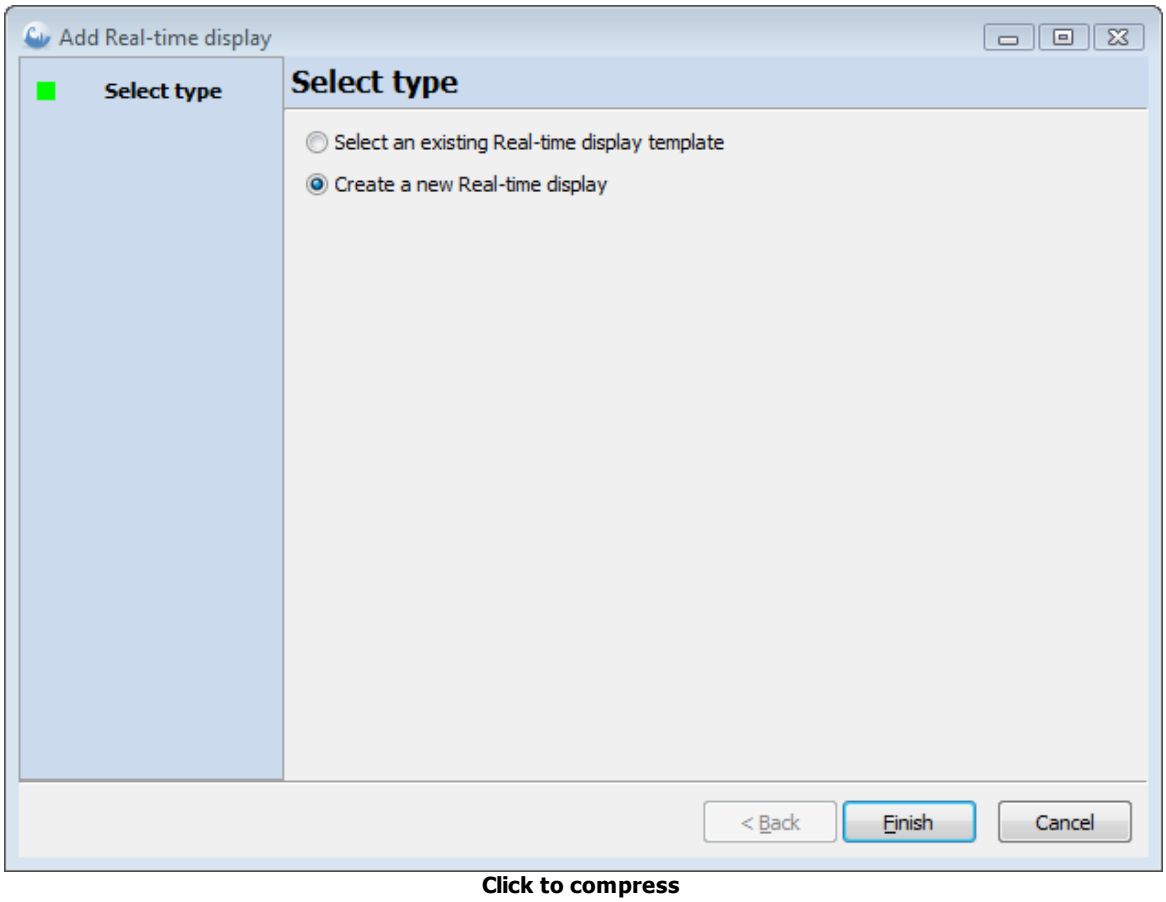
With the meter connected: you will see during the design process exactly which modules, detectors and calibrations your meter has and you can design the real-time display to suit your meter and the detectors you have available. You can also, if you are already in an x-ray room, start making measurements right away through the whole design process. It may be a little bit slower to make measurements during design time, as Ocean must "talk" to the meter frequently and this slows Ocean down a bit.

Using keyboard mode: you will see a "virtual" meter during the design process. This "virtual" meter has access to all detectors and probes we have for the Piranha and Barracuda, but the down side is that you may not have all the detectors yourself. When you design a real-time display using keyboard mode, make sure you only select detectors and probes that your own meter has. The big bonus in using keyboard mode is that template design goes much faster, as Ocean doesn't have to communicate with the meter all the time. You should also make sure that Ocean uses the correct "virtual" meter when you are in keyboard mode. The meter type is shown on the left side of the status bar #2.

The following example will show you how to set up a real-time display with the meter connected (we used a Piranha, but the process is exactly the same for the Barracuda). In this example we want to measure kVp, time, HVL, TF, exposure and exposure rate and will design a real-time display showing all the values we want to measure. Feel free to follow along and create the real-time display with us by using the following steps:

1. Go to the application button and select "New real-time display".

2. You can now select an existing template or create a new real-time display. For this example, we will select "Create a new real-time display" and click the Finish button.

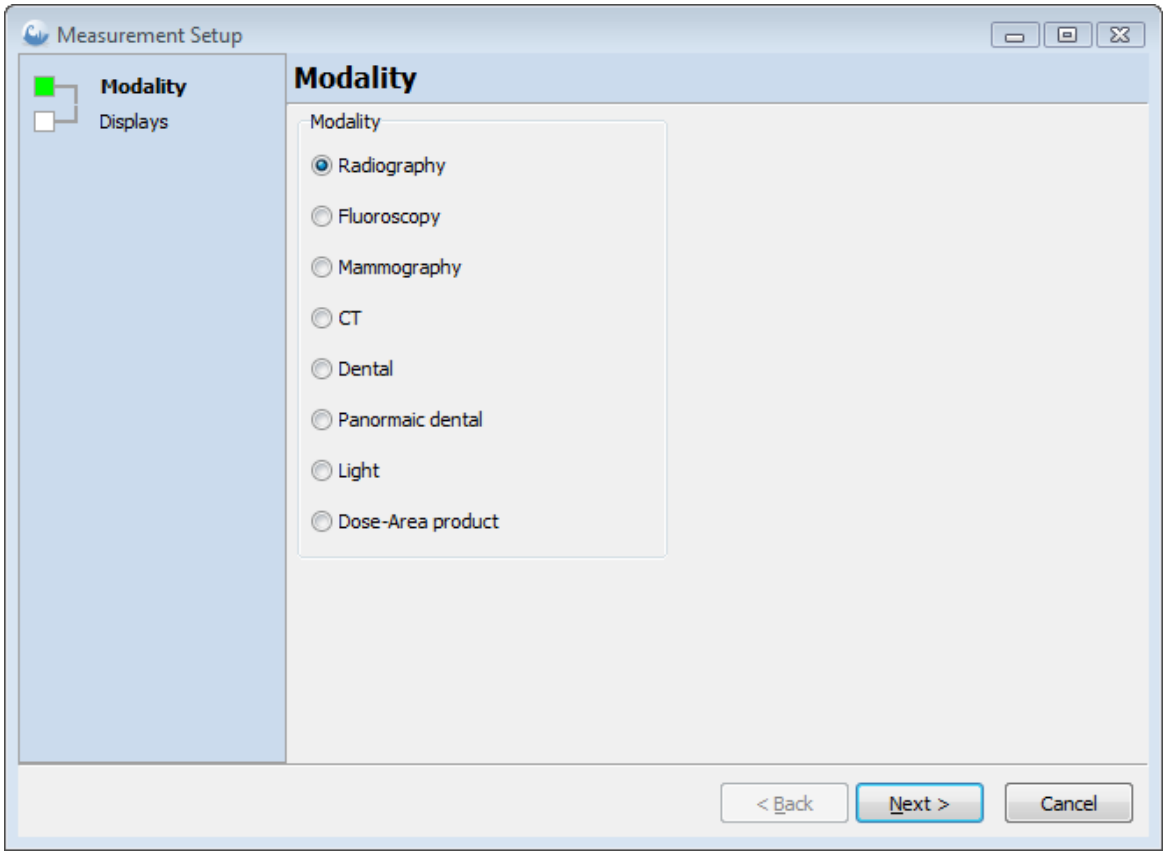


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3. The new template wizard will start and will guide you through the real-time display creation process. You can now see at the bottom that Status bar #2 is indicating that you are designing a real-time display and that it is in log mode. Log mode means that you can do measurements as soon as you created the real-time display and your measured data will be saved when you save the real-time display.

4. Click Next to continue with the wizard.

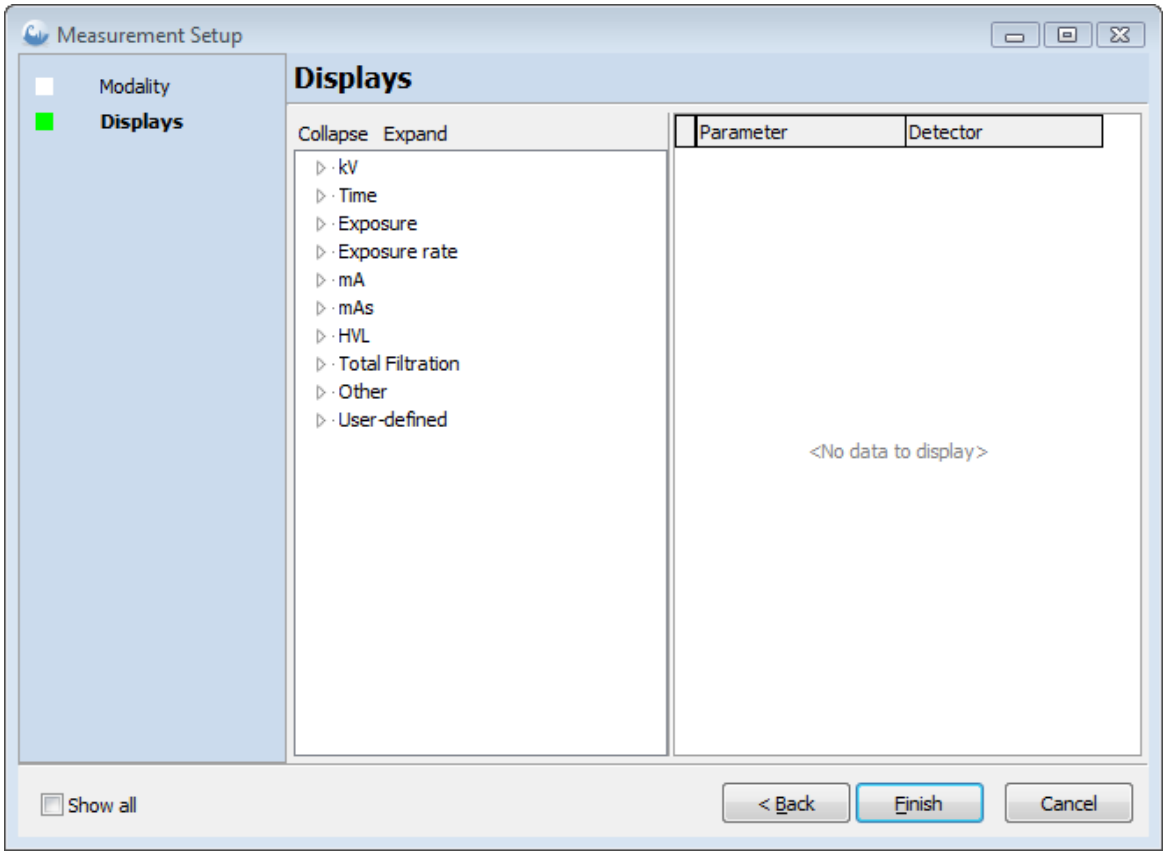
5. You are now asked to select a modality. For this example, we will select "Radiography". The modality information is used by Ocean to suggest the most suitable options to you during the design process.



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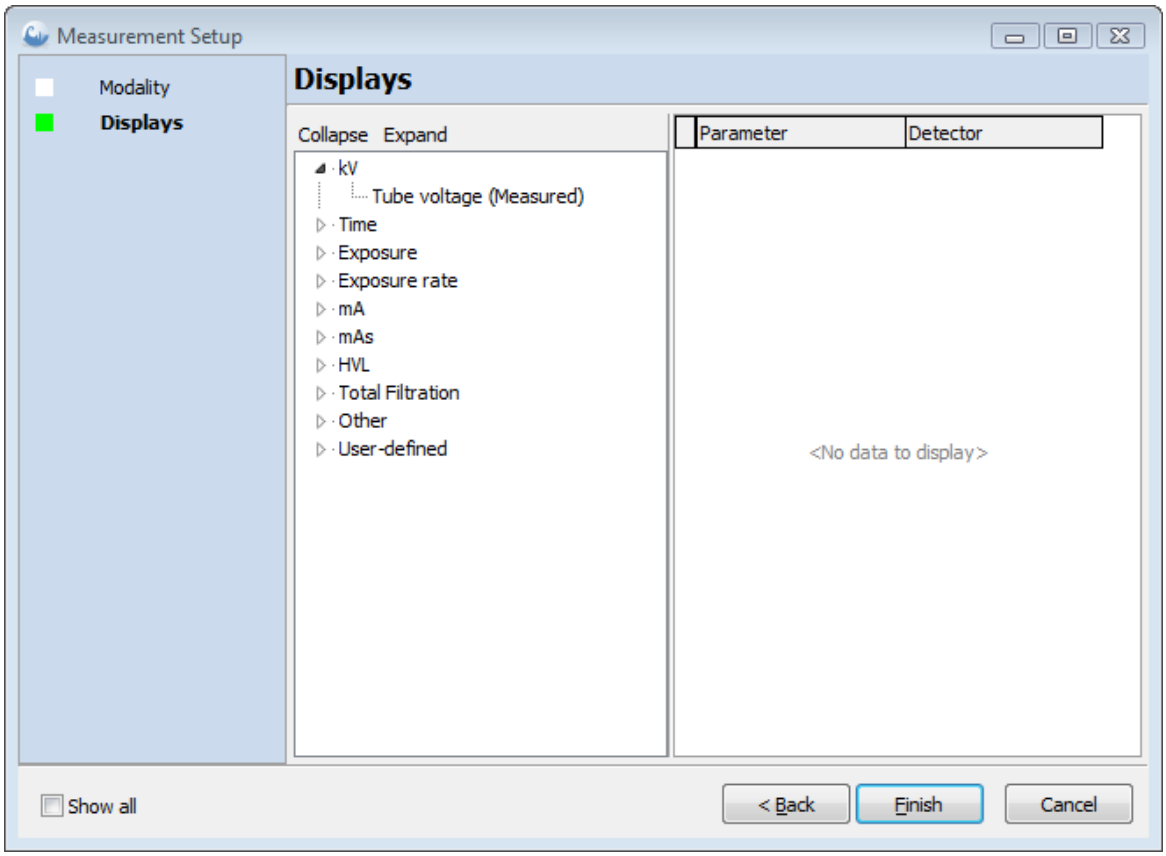
6. Click Next to continue with the wizard.

7. The wizard now displays the parameter selection window where you can select which parameters you wish to measure.



Click to compress

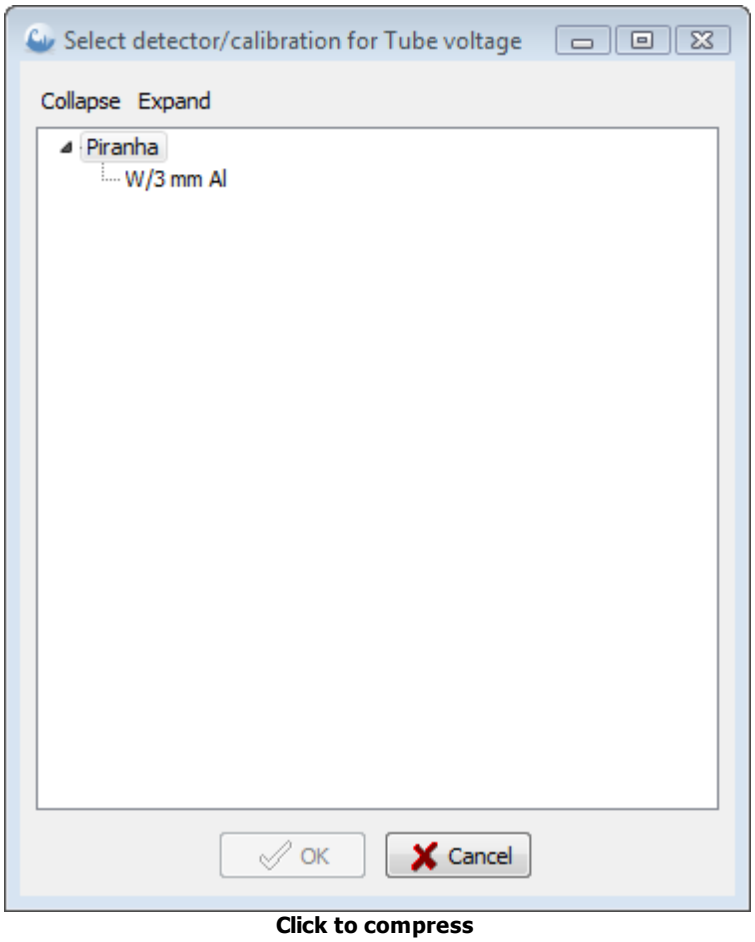
If you can't find what you need, check "Show all" in the lower left corner. Click on "kV" to open this group of columns.



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Depending on what license leve of Ocean you have (Professional, Connect or Display) you may see more, or less, choices under each item. The picture shows what it looks like when the Display license level is used. In this mode, only the "Tube voltage" measured parameter is available.

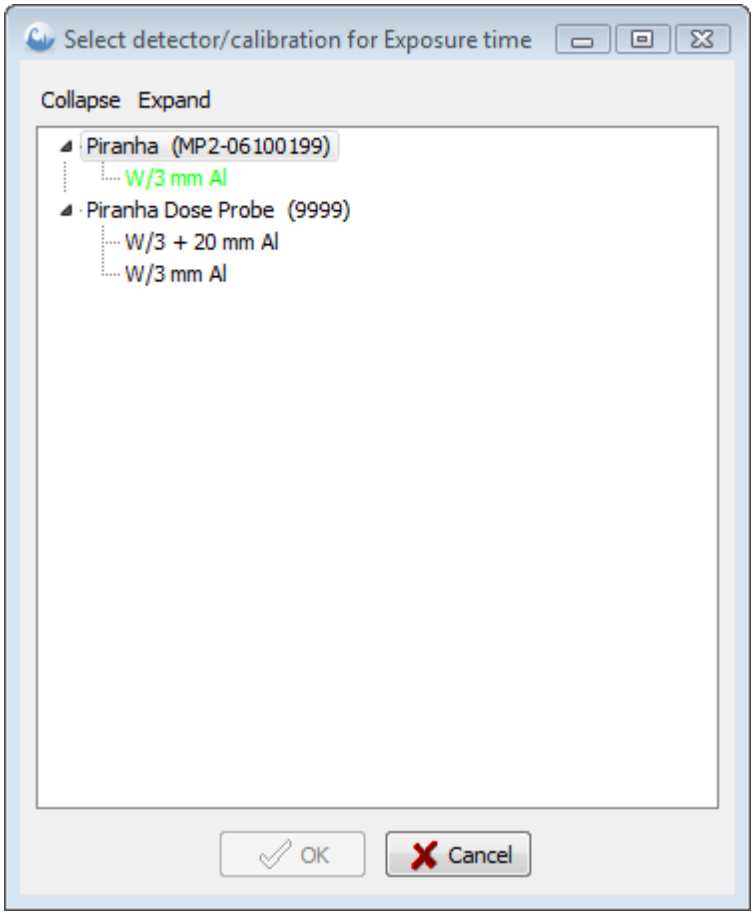
You can now use drag-and-drop or double-click to move columns from the left to the right side. If you want to remove something from the right side, select it and hit the Delete key on your keyboard. For this example, we will move the "Tube voltage (Measured)" parameter to the right side. When you select a measured parameter, in this case "Tube voltage (Measured)", you are also asked to specify which detector and calibration you intend to use. In this case, there is only one possible detector and one possible calibration.



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We will double-click on "W/3 mm Al", as this is the only available calibration for Radiography (or select it and click OK).

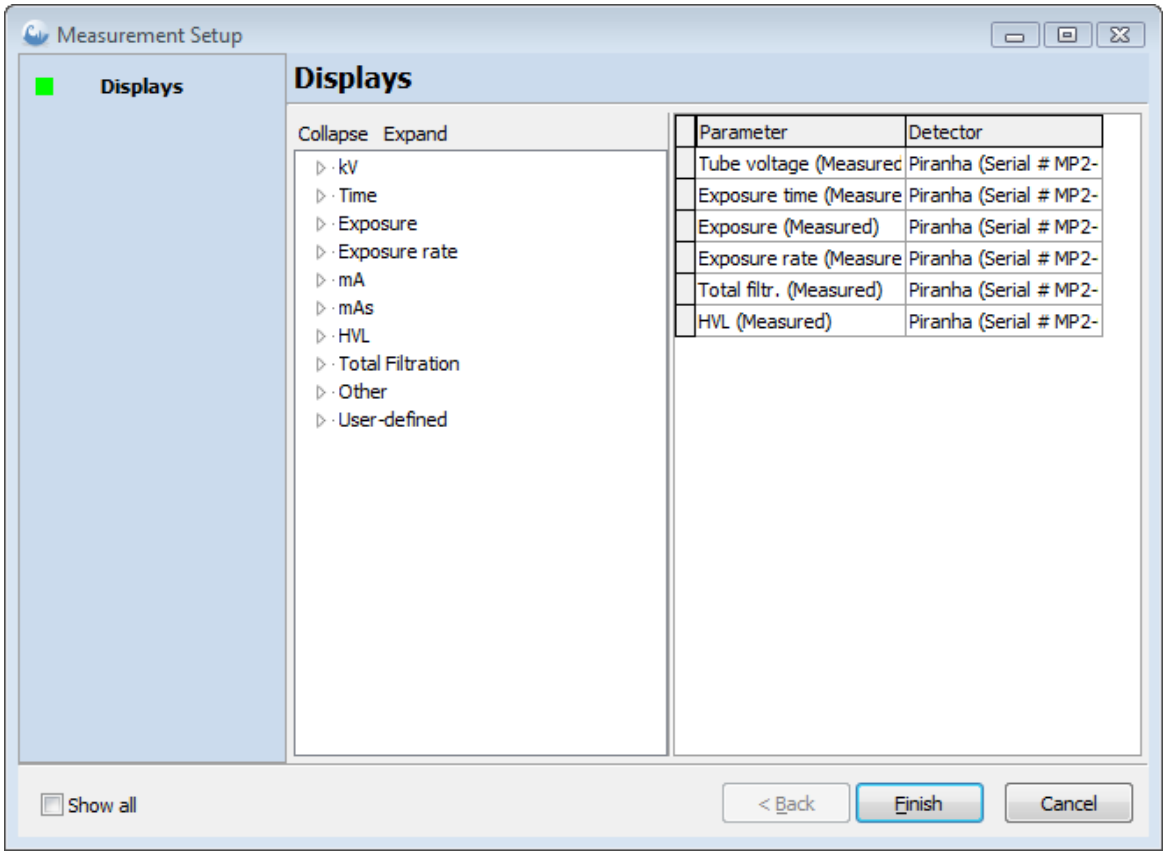
8. Next, we'll click Time and select "Exposure time". The detector/calibration dialogue is shown again:



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This window shows all available detectors for time measurement (with the Piranha only connected detectors are shown, in this case is the external dose probe connected). We will use the same detector we used for the kV (the internal). It is indicated with green text.

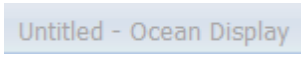
We will continue to add the remaining parameters and after we are done, the screen should look like this:



Click to compress

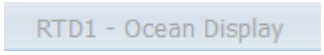
9. Click Finish to end the wizard.

10. At this point, we have not saved our work yet. The main title bar indicates "Untitled Ocean display". This means we did not give it a name yet and have not saved it.

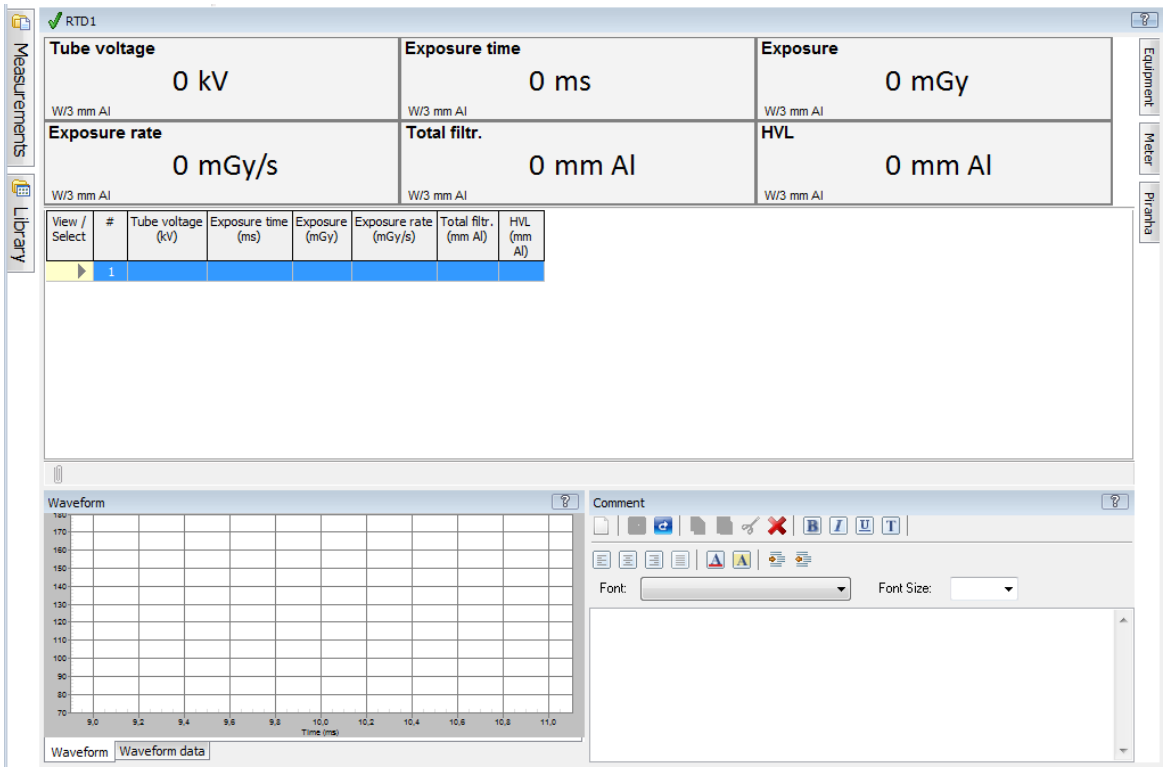


Let's save this display before going further by clicking the Save button on the Quick Access Toolbar or go to the Application menu and select Save.

11. We are now asked to give the display a name. This name is used to identify the real-time display in the Measurements tab. For this example, we will name this display "RTD1" and save it. The name is now indicated on the main title bar.



12. If you followed along with us, your screen should looks like this:



Click to compress

13. We are ready to start making exposures now, and the data from each exposure will be shown in the displays and in the grid below the displays. If you want to read more about real-time displays, click here...

You can do further modifications to the real-time display:

- Change size of displays.
- Change font and background color for the displays.
- Change order of the displays (just drag-and-drop).
- Clone displays, for example if you want to see an exposure in two different units. Clone the exposure display and change unit.
- Change position for the displays

3.2.4.2 Print

There are a few things you can do in the real-time display that will affect on how it appears when you print it:

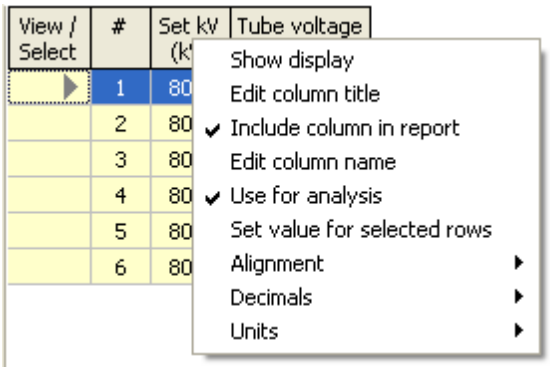
- Exclude columns from the print-out
- Include waveforms in the print-out
- Change the width of columns

Exclude columns from the print-out

All columns will be included in the print-out by default. You can exclude columns, if you like, that will prevent them from appearing in the print-out.

To exclude/include columns from the print-out:

1. Right-click on the column heading.



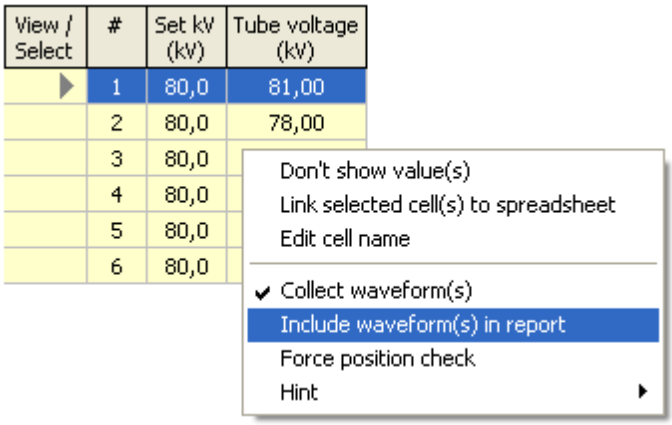
2. Uncheck or check "Include column in report" to exclude/include it in the print-out.

Include waveforms

No waveforms are included in the print-out by default. You can include waveform if you like by following the steps below:

1. Select a row (or use multi-select row to select multiple rows).

2. Right-click on the selected row(s).



3. Check or uncheck "Include waveform(s) in report" to include/exclude the waveforms in the print-out.

NOTE: "Collect waveform(s)" must also be checked if you want waveforms. As a default, waveforms are always collected when available.

Change the width of columns

The width you give columns on the screen will be saved in the template and used when the real-time display is printed. Use drag-and-drop to modify the width of the columns.

3.2.5 Standard columns (Definitions)

The standard columns are described In the following sections. The columns are divided into different column types and for each type a number of different columns are available. The following columns types are available:

Column type	**Columns related to...**
kV	measurement of tube voltage
Time	measurement of exposure time
Exposure	measurement of exposure (dose)
Exposure rate	measurements of exposure rate (dose rate)
Frames	measurement of frames, frame rate and exposure/frame, mAs/frame....

mA	measurements of tube current
mAs	measurements of tube current*time product (mAs)
HVL	direct measurement of half value layer
Total Filtration	direct measurement total filtration
Light	measurement of light, illuminance and luminance
CT exposure	measurement of CT dose (pencil ion chamber)
CT exposure rate	measurement of CT dose rate (pencil ion chamber)
DAP exposure	measurement of dose area product (DAP chamber)
DAP exposure	measurement of dose area product rate (DAP chamber)
User-defined calculations	add your own calculation
User-defined numeric value	enter measured values from the keyboard
Settings	set values and meter settings
Conditions	conditions related to the measurement
Testing	evaluation and analysis of measured data
Other	varios columns
User-defined	enter user-defiend text strings

3.2.5.1 kV

This group of columns is related to the measurement of tube voltage:

Set kV	Set value
Tube voltage	Measured value
kVp diff %	Relative difference between measured value and reference value
kVp diff Δ	Absolute difference between measured value and reference value
kVp diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.1.1 Set kV (Set value)

This is the kV set value. It is used to select a suitable kV range for the tube voltage measurement, but it is also the reference value when calculating the inaccuracy of kVp.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (kVp)
AGD(ACR)
AGD(EUREF)
AGD(IAEA)
HVL
QuickHVL

3.2.5.1.2 Tube voltage (Measured)

This is the measured tube voltage. There is only one detector that can measure tube voltage, but you can have multiple instances of this column to show the tube voltage differently, for instance, one column might show "kVp" and the other one "PPV". This value is used when calculating the inaccuracy of kVp.

This column is required for the following analysis
Accuracy (kVp)
Reproducibility (kVp)

3.2.5.1.3 kVp diff % (Calculated)

This is the calculated inaccuracy (relative) for tube voltage (kVp).

The following calculation is done on each row included in the analysis:

kVp diff % = **100 * (** Tube voltage (Measured) - Set kV **) /** Set kV

This column is required for the following analysis
Accuracy (kVp, relative)

3.2.5.1.4 kVp diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for tube voltage (kVp).

The following calculation is done on each row included in the analysis:

kVp diff Δ = Tube voltage (Measured) - Set kV

This column is required for the following analysis
Accuracy (kVp, absolute)

3.2.5.1.5 kVp diff from mean (%) (Calculated)

It is the calculated relative difference from the mean value of kVp. The mean value is calculated based on the measured kVp of all rows included in the reproducibility analysis.

It is calculated in the following way:

The mean value is calculated as:

kVp mean = **(kVp_1 + kVp_2 + ... + kVp_n) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

kVp diff from mean (%) = **100 * (** Tube voltage (Measured) **- kVp mean) / kVp mean**

This column is required for the following analysis
Reproducibility (kVp)

3.2.5.2 Time

This group of columns is related to the measurement of exposure time:

Set time	Set value
Exposure time	Measured value
Time diff %	Relative difference between measured value and reference value
Time diff Δ	Absolute difference between measured value and reference value
Time diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.2.1 Set time (Set value)

This is the time set value. This value is the reference value when calculating the inaccuracy of exposure time.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (time)

3.2.5.2.2 Exposure time (Measured)

This is the measured exposure time. There are several detectors that can measure exposure time. However, it is recommended that you use the internal detector. You can have several instances of this column but having more than one column of this type is not really practical.

This column is required for the following analysis
Accuracy (Exposure time)
Reproducibility (Exposure time)

3.2.5.2.3 Time diff % (Calculated)

This is the calculated inaccuracy (relative) for exposure time.

The following calculation is done on each row included in the analysis:

Time diff % = **100 * (** Exposure time (Measure) - Set time **) /** Set time

This column is required for the following analysis
Accuracy (Exposure time, relative)

3.2.5.2.4 Time diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for exposure time.

The following calculation is done on each row included in the analysis:

Time diff Δ = Exposure time (Measured) - Set time

This column is required for the following analysis
Accuracy (Exposure time, absolute)

3.2.5.2.5 Time diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of exposure time. The mean value is calculated based on the measured exposure time of all rows included in the reproducibility analysis.

It is calculated in the following way:

The mean value is calculated as:

Time mean = **(Exp time$_1$ + Exp time$_2$ + ... + Exp time$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Time diff from mean (%) = **100 * (** Exposure time (Measured) **- kVp mean) / kVp mean**

This column is required for the following analysis
Reproducibility (Exposure time)

3.2.5.3 Exposure

This group of columns is related to the measurement of exposure (dose):

Set exposure	Set value
Exposure (norm)	Normalized (measured) value
Exposure	Measured value
Exposure (win)	Measured value during the window
Exposure diff %	Relative difference between measured value and reference value
Exposure diff Δ	Absolute difference between measured value and reference value
Exposure diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.3.1 Set exposure (Set value)

This is the exposure set value. This value is the reference value when calculating the inaccuracy of exposure.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Exposure)

3.2.5.3.2 Exposure (Measured)

This is the measured exposure. There are several detectors that can measure exposure (dose). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating the inaccuracy of exposure.

This column or "Exposure (norm) (Measured)" is required for the following analysis
Accuracy (Exposure)
Reproducibility (Exposure)
AEC kV compensation (Exposure)
AEC mA compensation (Exposure)
AEC reproducibility (Exposure)
AEC reciprocity (Exposure)
AEC field balance (Exposure)
AEC density correction (Exposure)

3.2.5.3.3 Exposure (win) (Measured)

This is the measured exposure during the meters window time. There are several detectors that can measure exposure (dose). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units.

Please refer to the meter manual for the definition of window time.

This column can be used with the following analysis
Accuracy (Exposure)
Reproducibility (Exposure)
AEC kV compensation (Exposure)
AEC mA compensation (Exposure)
AEC reproducibility (Exposure)
AEC reciprocity (Exposure)
AEC field balance (Exposure)
AEC density correction (Exposure)

Warning!
Make sure you understand how this parameter works before using it to avoid incorrect results.

3.2.5.3.4 Exposure (norm) (Measured)

This is the normalized (normalized to a certain distance) measured exposure. There are several detectors that can measure exposure rate (dose). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. To get the exposure normalized the columns SDD and SSD are required. If both the SDD and SSD columns are not present, this column gives the same value as the "Exposure (Measured)" column. The exposure value can also be normalized to a certain mAs value. This is done by using the values Set mAs (Set value) and Ref mAs (Set value).

The normalized exposure is calculated as:

Exposure (norm) (Measured) = Exposure (Measured) *** (** SDD (Set value) **/** SSD (Set value) **)^2 * (** Ref mAs **/** Set mAs **)**

If the values SDD/SSD and Ref mAs/Set mAs are missing, the following formula is used:

Exposure (norm) (Measured) = Exposure (Measured)

This column or "Exposure (Measured)" is required for the following analysis
Accuracy (Exposure)
Reproducibility (Exposure)
AEC kV compensation (Exposure)
AEC mA compensation (Exposure)
AEC reproducibility (Exposure)
AEC reciprocity (Exposure)
AEC field balance (Exposure)
AEC density correction (Exposure)

3.2.5.3.5 Exposure diff % (Calculated)

This is the calculated inaccuracy (relative) for exposure.

The following calculation is done on each row included in the analysis:

Exposure diff % = **100 * (** Exposure (Measure) - Set exposure **) /** Set exposure

This column is required for the following analysis
Accuracy (Exposure, relative)

3.2.5.3.6 Exposure diff from mean (%) (Calculated)

It is the calculated relative difference from the mean value of exposure (dose). The mean value is calculated based on the measured exposure of all rows included in the reproducibility analysis.

The mean value is calculated as:

Exp mean = **(Exp_1 + Exp_2 + ... + Exp_n) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Exposure diff from mean (%) = **100 * (** Exposure (Measured) **- Exp mean) / Exp mean**

This column is required for the following analysis
Reproducibility (Exposure)

3.2.5.3.7 Exposure diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for exposure.

The following calculation is done on each row included in the analysis:

Exposure diff Δ = Exposure (Measured) - Set exposure

This column is required for the following analysis
Accuracy (Exposure, absolute)

3.2.5.4 Exposure rate

This group of columns is related to the measurement of exposure rate:

Set exposure rate	Set value
Exposure rate (norm)	Normalized (measured) value
Exposure rate	Measured value
Exposure rate (win)	Measured value during the window
Exposure rate diff %	Relative difference between measured value and reference value
Exposure rate diff Δ	Absolute difference between measured value and reference value
Exposure rate diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.4.1 Set exposure rate (Set value)

This is the exposure rate set value. This value is the reference value when calculating the inaccuracy of exposure rate.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Exposure rate)

3.2.5.4.2 Exposure rate (Measured)

This is the measured exposure rate. There are several detectors that can measure exposure rate (dose rate). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating the inaccuracy of exposure rate.

This column or "Exposure rate (norm) (Measured)" is required for the following analysis
Accuracy (Exposure rate)
Reproducibility (Exposure rate)

3.2.5.4.3 Exposure rate (w in) (Measured)

This is the measured exposure rate during the window. There are several detectors that can measure exposure rate (dose rate). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units.

This column can be used with the following analysis
Accuracy (Exposure rate)
Reproducibility (Exposure rate)

Warning!
Make sure you understand how this parameter works before using it to avoid incorrect results.

3.2.5.4.4 Exposure rate (norm) (Measured)

This is the normalized (normalized to a certain distance) measured exposure rate. There are several detectors that can measure exposure rate (dose rate). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. To get the exposure rate normalized the columns SDD and SSD are required. If both the SDD and SSD columns are not present, this column gives the same value as the "Exposure rate (Measured)" column. The exposure value can also be normalized to a certain mAs value. This is done by using the values Set mAs (Set value) and Ref mAs (Set value).

The normalized exposure is calculated as:

Exposure rate (norm) (Measured) = Exposure rate (Measured) *** (** SDD (Set value) **/** SSD (Set value) **)**^{2} *** (** Ref mAs **/** Set mAs **)**

If the values SDD/SSD and Ref mAs/Set mAs are missing, the following formula is used:

Exposure (norm) (Measured) = Exposure rate (Measured)

This column or "Exposure rate (Measured)" is required for the following analysis
Accuracy (Exposure rate)
Reproducibility (Exposure rate)

3.2.5.4.5 Exposure rate diff % (Calculated)

This is the calculated inaccuracy (relative) for exposure rate.

The following calculation is done on each row included in the analysis:

Exposure rate diff % = **100 * (** Exposure rate (Measure) - Set exposure rate **) /** Set exposure rate

This column is required for the following analysis

Accuracy (Exposure rate, relative)

3.2.5.4.6 Exposure rate diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for exposure rate.

The following calculation is done on each row included in the analysis:

Exposure rate diff Δ = Exposure rate (Measured) - Set exposure rate

This column is required for the following analysis
Accuracy (Exposure rate, absolute)

3.2.5.4.7 Exposure rate diff from mean (%) (Calculated)

It is the calculated relative difference from the mean value of exposure rate (dose rate). The mean value is calculated based on the measured exposure rate of all rows included in the reproducibility analysis.

It is calculated in the following way:

The mean value is calculated as:

Exp rate mean = **(Exp rate$_1$ + Exp rate$_2$ + ... + Exp rate$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Exposure rate diff from mean (%) = **100 * (** Exposure rate (Measured) **- Exp rate mean) / Exp rate mean**

This column is required for the following analysis
Reproducibility (Exposure rate)

3.2.5.5 Frame count

This group of columns is related to the measurement of frame or pulse count:

Set frames	Set value
Frames	Measured value
Frames diff %	Relative difference between measured value and reference value
Frames diff Δ	Absolute difference between measured value and reference value
Frames diff from mean (%)	Relative difference between measured value and the mean value

Note!
You can just rename the column headings to "Pulse" if you want to use this instead of "Frame"

3.2.5.5.1 Set frames (Set value)

This is the frame (pulse) count set value. This value is the reference value when calculating the inaccuracy of frame (pulse) count.

You can only have one instance of this column.

This column is required for the following analysis

Accuracy (Frame count)

3.2.5.5.2 Frames (Measured)

This is the measured frame (pulse) count. There are several detectors that can measure frame (pulse) count. You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating the inaccuracy of frame count.

This column is required for the following analysis
Accuracy (Frame count)
Reproducibility (Frame count)

3.2.5.5.3 Frames diff % (Calculated)

This is the calculated inaccuracy (relative) for frame (pulse) count.

The following calculation is done on each row included in the analysis:

Frames diff % = **100 * (** Frames (Measure) - Set frames (Set value) **) /** Set frames

This column is required for the following analysis
Accuracy (Frame count, relative)

3.2.5.5.4 Frames diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for frame (pulse) count.

The following calculation is done on each row included in the analysis:

Frames diff Δ = Frames (Measured) - Set frames

This column is required for the following analysis
Accuracy (Frame count, absolute)

3.2.5.5.5 Frames diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of frame (pulse) count. The mean value is calculated based on the measured exposure of all rows included in the reproducibility analysis.

The mean value is calculated as:

Frames mean = **(Frames_1 + Frames_2 + ... + Frames_n) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Frames diff from mean (%) = **100 * (** Frames (Measured) **- Frames mean) / Frames mean**

This column is required for the following analysis

Reproducibility (Frame (pulse) count)

3.2.5.6 Frame rate

This group of columns is related to the measurement of frame or pulse rate:

Set frame rate	Set value
Frames/s	Measured value
Frames/s diff %	Relative difference between measured value and reference value
Frames/s diff Δ	Absolute difference between measured value and reference value
Frames/s diff from mean (%)	Relative difference between measured value and the mean value

Note!
You can just rename the column headings to "Pulse" if you want to use this instead of "Frame"

3.2.5.6.1 Set frames/s (Set value)

This is the frame (pulse) rate set value. This value is the reference value when calculating the inaccuracy of frame (pulse) rate.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Frame rate)

3.2.5.6.2 Frames/s (Measured)

This is the measured frame (pulse) rate. There are several detectors that can measure frame (pulse) rate. You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating the inaccuracy of frame (pulse) rate.

This column is required for the following analysis
Accuracy (Frame rate)
Reproducibility (Frame rate)

3.2.5.6.3 Frames/s diff % (Calculated)

This is the calculated inaccuracy (relative) for frame (pulse) rate.

The following calculation is done on each row included in the analysis:

Frames/s diff % = **100 * (** Frames/s (Measure) - Set frames/s **) /** Set frames/s

This column is required for the following analysis
Accuracy (Frame rate, relative)

3.2.5.6.4 Frames/s diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for frame (pulse) rate.

The following calculation is done on each row included in the analysis:

Frames/s diff Δ = Frames/s (Measured) - Set frames/s

This column is required for the following analysis
Accuracy (Frame rate, absolute)

3.2.5.6.5 Frames/s diff from mean (%) (Calculated)

This the calculated relative difference from the mean value of frame (pulse) count. The mean value is calculated based on the measured exposure of all rows included in the reproducibility analysis.

The mean value is calculated as:

Frames/s mean = **(Frames/s$_1$ + Frames/s$_2$ + ... + Frames/s$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Frames/s diff from mean (%) = **100 * (** Frames/s (Measured) **- Frames/s mean) / Frames/s mean**

This column is required for the following analysis
Reproducibility (Frame (pulse) count)

3.2.5.7 Exposure/frame

This group of columns is related to the measurement of exposure/frame (dose/frame):

Set Exposure/frame	Set value
Exposure/frame (norm)	Normalized (measured) value
Exposure/frame	Measured value
Exposure/frame diff %	Relative difference between measured value and reference value
Exposure/frame diff Δ	Absolute difference between measured value and reference value
Exposure/frame diff from mean (%)	Relative difference between measured value and the mean value

Note!
You can just rename the column headings to "Pulse" if you want to use this instead of "Frame"

3.2.5.7.1 Set Exposure/frame (Set value)

This is the Exposure/frame (Exposure/pulse or dose/pulse) set value. This value is the reference value when calculating the inaccuracy of Exposure/frame.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Exposure/frame)

3.2.5.7.2 Exposure/frame (norm) (Measured)

This is the normalized (normalized to a certain distance) measured exposure/frame. There are several detectors that can measure exposure/frame (Dose/frame or Dose/pulse). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. To get the Frame exposure rate normalized the columns SDD and SSD are required. If both the SDD and SSD columns are not present, this column gives the same value as the "Frame exposure rate (Measured)" column.

This column or "Exposure/frame (Measured)" is required for the following analysis

Accuracy (Exposure/frame)
Reproducibility (Exposure/Frame)

3.2.5.7.3 Exposure/frame (Measured)

This is the measured Exposure/frame (Exposure/pulse or Dose/pulse). There are several detectors that can measure Exposure/frame. You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating the inaccuracy of Exposure/frame.

This column or "Exposure/frame (norm) (Measured)" is required for the following analysis
Accuracy (Exposure/frame)
Reproducibility (Exposure/frame)

3.2.5.7.4 Exposure/frame diff % (Calculated)

This is the calculated inaccuracy (relative) for Exposure/frame (Exposure/pulse or dose/pulse).

The following calculation is done on each row included in the analysis:

Exposure/frame diff % = **100 * (** Exposure/frame (Measure) - Set Exposure/frame **) /** Set Exposure/frame

This column is required for the following analysis
Accuracy (Exposure/frame, relative)

3.2.5.7.5 Exposure/frame diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for Exposure/frame (Exposure/pulse or Dose/pulse).

The following calculation is done on each row included in the analysis:

Exposure/frame diff Δ = Exposure/frame (Measured) - Set Exposure/frame

This column is required for the following analysis
Accuracy (Exposure/frame, absolute)

3.2.5.7.6 Exposure/frame diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of Exposure/frame (Exposure/pulse or Dose/pulse). The mean value is calculated based on the measured exposure of all rows included in the reproducibility analysis.

The mean value is calculated as:

Exposure/frame mean = **(Exp/frame$_1$ + Exp/frame$_2$ + ... + Exp/frame$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Exposure/frame diff from mean (%) = **100 * (** Exposure/frame (Measured) **- Exp/frame mean) / Exp/frame mean**

This column is required for the following analysis
Reproducibility (Exposure/frame)

3.2.5.8 mAs/Frame

This group of columns is related to the measurement of mAs/frame (mAs/pulse):

Set mAs/frame	Set value
mAs/frame	Measured value
mAs/frame diff %	Relative difference between measured value and reference value
mAs/frame diff Δ	Absolute difference between measured value and reference value
mAs/frame diff from mean (%)	Relative difference between measured value and the mean value

Note!
You can just rename the column headings to "Pulse" if you want to use this instead of "Frame"

3.2.5.8.1 Set mAs/frame (Set value)

This is the mAs/frame (mAs/pulse) set value. This value is the reference value when calculating the inaccuracy of mAs/frame.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (mAs/frame)

3.2.5.8.2 mAs/frame (Measured)

This is the measured mAs/frame (mAs/pulse). There are several detectors that can measure mAs/frame. This value is used when calculating the inaccuracy of mAs/frame.

This column or is required for the following analysis
Accuracy (mAs/frame)
Reproducibility (mAs/frame)

3.2.5.8.3 mAs/frame diff % (Calculated)

This is the calculated inaccuracy (relative) for mAs/frame (mAs/pulse).

The following calculation is done on each row included in the analysis:

mAs/frame diff % = **100 * (** mAs/frame (Measure) - Set mAs/frame **) /** Set mAs/frame

This column is required for the following analysis
Accuracy (mAs/frame, relative)

3.2.5.8.4 mAs/frame diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for mAs/frame (mAs/pulse).

The following calculation is done on each row included in the analysis:

mAs/frame diff Δ = mAs/frame (Measured) - Set mAs/frame

This column is required for the following analysis
Accuracy (mAs/frame, absolute)

3.2.5.8.5 mAs/frame diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of mAs/frame (mAs/pulse). The mean value is calculated based on the measured mAs/frame of all rows included in the reproducibility analysis.

The mean value is calculated as:

mAs/frame mean = **(mAs/frame$_1$ + mAs/frame$_2$ + ... + mAs/frame$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

mAs/frame diff from mean (%) = **100 * (** mAs/frame (Measured) **- mAs/frame mean) / mAs/frame mean**

This column is required for the following analysis
Reproducibility (mAs/frame)

3.2.5.9 Frame mA

This group of columns is related to the measurement of frame or pulse mA:

Set frame mA	Set value
Frame mA	Measured value
Frame mA diff %	Relative difference between measured value and reference value
Frame mA diff Δ	Absolute difference between measured value and reference value
Frame mA diff from mean (%)	Relative difference between measured value and the mean value

Note!
You can just rename the column headings to "Pulse" if you want to use this instead of "Frame"

3.2.5.9.1 Set frame mA (Set value)

This is the frame (pulse) mA set value. This value is the reference value when calculating the inaccuracy of frame (pulse) mA.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Frame mA)

3.2.5.9.2 Frame mA (Measured)

This is the measured frame (pulse) mA. There are several detectors that can measure frame (pulse) mA. This value is used when calculating the inaccuracy of Frame mA.

This column is required for the following analysis
Accuracy (Frame mA)
Reproducibility (Frame mA)

3.2.5.9.3 Frame mA diff % (Calculated)

This is the calculated inaccuracy (relative) for frame (pulse) mA.

The following calculation is done on each row included in the analysis:

Frame mA diff % = **100 * (** Frame mA (Measure) - Set frame mA **) /** Set frame mA

This column is required for the following analysis
Accuracy (Frame mA, relative)

3.2.5.9.4 Frame mA diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for frame (pulse) mA.

The following calculation is done on each row included in the analysis:

Frame mA diff Δ = Frame mA (Measured) - Set frame mA

This column is required for the following analysis
Accuracy (Frame mA, absolute)

3.2.5.9.5 Frame mA diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of Frame (pulse) mA. The mean value is calculated based on the measured exposure of all rows included in the reproducibility analysis.

The mean value is calculated as:

Frame mA mean = **(Frame mA$_1$ + Frame mA$_2$ + ... + Frame mA$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Frame mA diff from mean (%) = **100 * (** Frame mA (Measured) **- Frame mA mean) / Frame mA mean**

This column is required for the following analysis
Reproducibility (Frame mA)

3.2.5.10 Frame exposure rate

This group of columns is related to the measurement of Frame exposure rate:

Set frame exp. rate	Set value
Frame exp. rate (norm)	Normalized (measured) value
Frame exp. rate	Measured value
Frame exp. rate diff %	Relative difference between measured value and reference value
Frame exp. rate diff Δ	Absolute difference between measured value and reference value
Frame exp. rate diff from mean (%)	Relative difference between measured value and the mean value

Note!
You can just rename the column headings to "Pulse" if you want to use this instead of "Frame"

3.2.5.10.1 Set frame exp. rate (Set value)

This is the exposure Frame exposure rate set value. This value is the reference value when calculating the inaccuracy of Frame exposure rate.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Frame exposure rate)

3.2.5.10.2 Frame exp. rate (norm) (Measured)

This is the normalized (normalized to a certain distance) measured Frame exposure rate. There are several detectors that can measure Frame exposure rate. You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. To get the Frame exposure rate normalized the columns SDD and SSD are required. If both the SDD and SSD columns are not present, this column gives the same value as the "Frame exposure rate (Measured)" column.

This column or "Frame exposure rate (Measured)" is required for the following analysis
Accuracy (Frame exposure rate)
Reproducibility (Frame exposure rate)

3.2.5.10.3 Frame exp. rate (Measured)

This is the measured Frame exposure rate. There are several detectors that can measure Frame exposure rate. You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating the inaccuracy of Frame exposure rate.

This column or "Exposure rate (Measured)" is required for the following analysis
Accuracy (Frame exposure rate)
Reproducibility (Frame exposure rate)

3.2.5.10.4 Frame exp. diff % (Calculated)

This is the calculated inaccuracy (relative) for Frame exposure rate.

The following calculation is done on each row included in the analysis:

Frame exp. diff % = **100 * (** Frame exp. rate (Measure) - Set frame exp. rate **) /** Set frame exp. rate

This column is required for the following analysis
Accuracy (Frame exposure rate, relative)

3.2.5.10.5 Frame exp. diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for Frame exposure rate.

The following calculation is done on each row included in the analysis:

Frame exp. diff Δ = Frame exp. rate (Measured) - Set frame exp. rate

This column is required for the following analysis
Accuracy (Frame exposure rate, absolute)

3.2.5.10.6 Frame exp. diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of Frame exposure rate. The mean value is calculated based on the measured Frame exposure rate of all rows included in the reproducibility analysis.

The mean value is calculated as:

Frame exp rate mean = **(Frame exp rate$_1$ + Frame exp rate$_2$ + ... + Frame exp rate$_n$) / n**
(based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Frame exp. rate diff from mean (%) = **100 * (** Frame exp. rate (Measured) **- Frame exp rate mean) / Frame exp rate mean**

This column is required for the following analysis
Reproducibility (Frame exposure rate)

3.2.5.11 Pulse Width

This group of columns is related to the measurement of pulse width.

Set pulse width	Set value
Pulse width	Measured value
Pulse width diff %	Relative difference between measured value and reference value
Pulse width diff Δ	Absolute difference between measured value and reference value
Pulse width diff from mean (%)	Relative difference between measured value and the mean value

Note!
You can just rename the column headings to "Frame" if you want to use this instead of "Pulse"

3.2.5.11.1 Set pulse width (Set value)

This is the pulse width set value. This value is the reference value when calculating the inaccuracy of pulse width.

You can only have one instance of this column.

This column is required for the following analysis

Accuracy (Pulse width)

3.2.5.11.2 Pulse width (Measured)

This is the measured pulse width. This value is used when calculating the inaccuracy of pulse width.

This column is required for the following analysis
Accuracy (Pulse width)
Reproducibility (Pulse width)

3.2.5.11.3 Pulse width diff % (Calculated)

This is the calculated inaccuracy (relative) for pulse width.

The following calculation is done on each row included in the analysis:

Pulse width diff % = **100 * (** Pulse width (Measure) - Set pulse width **) /** Set pulse width

This column is required for the following analysis
Accuracy (Pulse width, relative)

3.2.5.11.4 Pulse width diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for pulse width.

The following calculation is done on each row included in the analysis:

Pulse width diff Δ = Pulse width (Measured) - Set pulse width

This column is required for the following analysis
Accuracy (Pulse width, absolute)

3.2.5.11.5 Pulse width diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of pulse width. The mean value is calculated based on the measured pulse width of all rows included in the reproducibility analysis.

The mean value is calculated as:

Pulse width mean = **(Pulse width$_1$ + Pulse width$_2$ + ... + Pulse width$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Pulse width diff from mean (%) = **100 * (** Pulse width (Measured) **- Pulse width mean) / Pulse width mean**

This column is required for the following analysis
Reproducibility (Pulse width)

3.2.5.12 Duty Cycle

This group of columns is related to the measurement of duty cycle:

Set duty cycle	Set value
Pulse duty cycle	Measured value
Duty cycle diff Δ	Absolute difference between measured value and reference value
Duty cycle diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.12.1 Set duty cycle (Set value)

This is the duty cycle set value. This value is the reference value when calculating the inaccuracy of duty cycle.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Duty cycle)

3.2.5.12.2 Duty cycle (Measured)

This is the measured duty cycle. This value is used when calculating the inaccuracy of duty cycle.

This column is required for the following analysis
Accuracy (Duty cycle)
Reproducibility (Duty cycle)

3.2.5.12.3 Duty cycle diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for duty cycle. :

The following calculation is done on each row included in the analysis:

Duty cycle diff Δ = Duty cycle (Measured) - Set duty cycle

This column is required for the following analysis
Accuracy (Duty cycle, absolute)

3.2.5.12.4 Duty cycle diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of duty cycle. The mean value is calculated based on the measured duty cycle of all rows included in the reproducibility analysis.

The mean value is calculated as:

Duty cycle mean = **(Duty cycle$_1$ + Duty cycle$_2$ + ... + Duty cycle$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Duty cycle diff from mean (%) = **100 * (** Duty cycle (Measured) **- Duty cycle mean) / Duty cycle mean**

This column is required for the following analysis
Reproducibility (Duty cycle)

3.2.5.13 mA

This group of columns is related to measurement of tube current:

Set mA	Set value
Tube mA	Measured value
Tube mA (win)	Measured value during the window
mA diff %	Relative difference between measured value and reference value
mA diff Δ	Absolute difference between measured value and reference value
mA diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.13.1 Set mA (Set value)

This is the mA set value. This value is the reference value when calculating the inaccuracy of mA.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (mA)

3.2.5.13.2 Tube mA (Measured)

This is the measured tube mA. This value is used when calculating the inaccuracy, reproducibility of mA. It may also be used when analyzing the mA linearity.

This column is required for the following analysis
Accuracy (mA)
Reproducibility (mA)
mA linearity (optional)

3.2.5.13.3 Tube mA (win) (Measured)

This is the measured tube mA during the window time.

This column can be used in the following analysis
Accuracy (mA)
Reproducibility (mA)
mA linearity (optional)

Warning!
Make sure you understand how this parameter works before using it to avoid incorrect results.

3.2.5.13.4 mA diff % (Calculated)

This is the calculated inaccuracy (relative) for tube current (mA).

The following calculation is done on each row included in the analysis:

mA diff % = **100 * (** Tube mA (Measured) - Set mA **) /** Set mA

This column is required for the following analysis

Accuracy (mA, relative)

3.2.5.13.5 mA diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for tube current (mA).

The following calculation is done on each row included in the analysis:

mA diff Δ = Tube mA (Measured) - Set mA

This column is required for the following analysis
Accuracy (mA, absolute)

3.2.5.13.6 mA diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of mA. The mean value is calculated based on the measured mA of all rows included in the reproducibility analysis.

The mean value is calculated as:

mA mean = $\mathbf{(mA_1 + mA_2 + ... + mA_n) / n}$ (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

mA diff from mean (%) = **100 * (** Tube mA (Measured) **- mA mean) / mA mean**

This column is required for the following analysis
Reproducibility (mA)

3.2.5.14 mAs

This group of columns is related to the measurement of mAs.

Set mAs	Set value
Tube mAs	Measured value
Tube mAs (win)	Measured value during the window time
mAs diff %	Relative difference between measured value and reference value
mAs diff Δ	Absolute difference between measured value and reference value
mAs diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.14.1 Set mAs (Set value)

This is the mAs set value. This value is the reference value when calculating the inaccuracy of mAs.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (mAs)
mA linearity (if evaluated based on Set mAs)

3.2.5.14.2 Tube mAs (Measured)

This is the measured tube mAs. This value is used when calculating the inaccuracy, reproducibility of mAs. It may also be used when analyzing the mA linearity.

This column is required for the following analysis
Accuracy (mAs)
Reproducibility (mAs)
mA linearity (optional)

3.2.5.14.3 Tube mAs (win) (Measured)

This is the measured tube mAs during the window time.

This column can be used in the following analysis
Accuracy (mAs)
Reproducibility (mAs)
mA linearity (optional)

Warning!
Make sure you understand how this parameter works before using it to avoid incorrect results.

3.2.5.14.4 mAs diff % (Calculated)

This is the calculated inaccuracy (relative) for tube mAs.

The following calculation is done on each row included in the analysis:

mAs diff % = **100 * (** Tube mAs (Measured) - Set mAs **) /** Set mAs

This column is required for the following analysis
Accuracy (mAs, relative)

3.2.5.14.5 mAs diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for tube mAs.

The following calculation is done on each row included in the analysis:

mAs diff Δ = Tube mAs (Measured) - Set mAs

This column is required for the following analysis
Accuracy (mAs, absolute)

3.2.5.14.6 mAs diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of mAs. The mean value is calculated based on the measured mAs of all rows included in the reproducibility analysis.

The mean value is calculated as:

mAs mean = **(mAs_1 + mAs_2 + ... + mAs_n) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

mAs diff from mean (%) = **100 * (** Tube mAs (Measured) **- mAs mean) / mAs mean**

This column is required for the following analysis
Reproducibility (mAs)

3.2.5.15 HVL

This group of columns is related to the measurement of HVL (QuickHVL):

Set HVL	Set value
HVL	Measured value
HVL diff %	Relative difference between measured value and reference value
HVL diff Δ	Absolute difference between measured value and reference value
HVL diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.15.1 Set HVL (Set value)

This is the QuickHVL set value. This value is the reference value when calculating the inaccuracy of QuickHVL. Note that Accuracy is not the normal way to evaluate HVL. Instead, use the QuickHVL analysis.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (HVL)

3.2.5.15.2 HVL (Measured)

This is the measured HVL value (QuickHVL). This value is used when calculating the inaccuracy and reproducibility of HVL.

This column is required for the following analysis
Accuracy (HVL)
Reproducibillity (HVL)
QuickHVL

3.2.5.15.3 HVL diff % (Calculated)

This is the calculated inaccuracy (relative) for HVL.

The following calculation is done on each row included in the analysis:

HVL diff % = **100 * (** HVL (Measured) - Set HVL **) /** Set HVL

This column is required for the following analysis
Accuracy (HVL, relative)

3.2.5.15.4 HVL diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for HVL.

The following calculation is done on each row included in the analysis:

HVL diff Δ = HVL (Measured) - Set HVL

This column is required for the following analysis
Accuracy (HVL, absolute)

3.2.5.15.5 HVL diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of HVL. The mean value is calculated based on the measured HVL of all rows included in the reproducibility analysis.

The mean value is calculated as:

HVL mean = **(HVL_1 + HVL_2 + ... + HVL_n) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

HVL diff from mean (%) = **100 * (** HVL (Measured) **- HVL mean) / HVL mean**

This column is required for the following analysis
Reproducibility (HVL)

3.2.5.16 Total filtration

This group of columns is related to the measurement of total filtration:

Set TF	Set value
Total filtr.	Measured value
Total filtr. diff %	Relative difference between measured value and reference value
Total filtr. diff Δ	Absolute difference between measured value and reference value
Total filtr. diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.16.1 Set TF (Set value)

This is the total filtration set value. This value is the reference value when calculating the inaccuracy of total filtration.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Total filtration)

3.2.5.16.2 Total filtr. (Measured)

This is the measured total filtration. This value is used when calculating the inaccuracy and reproducibility of total filtration.

This column is required for the following analysis
Accuracy (Total filtration)
Reproducibility (Total filtration)

3.2.5.16.3 Total filtr. diff % (Calculated)

This is the calculated inaccuracy (relative) for total filtration.

The following calculation is done on each row included in the analysis:

Total filtr. diff % = **100 * (** Total filtr. (Measured) - Set TF **) /** Set TF

This column is required for the following analysis
Accuracy (Total filtration, relative)

3.2.5.16.4 Total filtr. diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for total filtration.

The following calculation is done on each row included in the analysis:

Total filtr. diff Δ = Total filtr. (Measured) - Set TF

This column is required for the following analysis
Accuracy (Total filtration, absolute)

3.2.5.16.5 Total filtr. diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of total filtration. The mean value is calculated based on the measured total filtration of all rows included in the reproducibility analysis.

The mean value is calculated as:

TF mean = **(TF_1 + TF_2 + ... + TF_n) / n** (based on rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

TF diff from mean (%) = **100 * (** Total filtr. (Measured) **- TF mean) / TF mean**

This column is required for the following analysis
Reproducibility (Total filtration)

3.2.5.17 Light

This group of columns is related to the measurement of light (illuminance and luminance):

Set Light	Set value
Light	Measured value
Light (win)	Measured value during the window time
Light diff %	Relative difference between measured value and reference value
Light diff Δ	Absolute difference between measured value and reference value
Light diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.17.1 Set Light (Set value)

This is the light set value (illuminance or luminance, depending on the user's selection). This value is the reference value when calculating the inaccuracy of light.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Light)

3.2.5.17.2 Light (Measured)

This is the measured light (illuminance or luminance) value. This value is used when calculating the inaccuracy and reproducibility of light.

This column is required for the following analysis
Accuracy (Light)
Reproducibility (Light)

3.2.5.17.3 Light (win) (Measured)

This is the measured light (illuminance or luminance) value during the window time.

This column can be used in the following analysis
Accuracy (Light)
Reproducibility (Light)

Warning!
Make sure you understand how this parameter works before using it to avoid incorrect results.

3.2.5.17.4 Light diff % (Calculated)

This is the calculated inaccuracy (relative) for light.

The following calculation is done on each row included in the analysis:

Light diff % = **100 * (** Light (Measured) - Set Light **) /** Set Light

This column is required for the following analysis
Accuracy (Light, relative)

3.2.5.17.5 Light diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for light.

The following calculation is done on each row included in the analysis:

Light diff Δ = Light (Measured) - Set Light

This column is required for the following analysis
Accuracy (Light, absolute)

3.2.5.17.6 Light diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of light measurement. The mean value is calculated based on the measured light value of all rows included in the light analysis.

The mean value is calculated as:

Light mean = **($Light_1$ + $Light_2$ + ... + $Light_n$) / n** (based on all rows included in the light analysis)

and the following calculation is done on each row included in the light analysis:

Light diff from mean (%) = **100 * (** Light (Measured) **- Light mean) / Light mean**

This column is required for the following analysis
Reproducibility (Light)

3.2.5.18 CT exposure

This group of columns is related to the measurement of CT exposure (CT dose).

Set CT exposure	Set value
CT exposure	Measured value
CT exposure diff %	Relative difference between measured value and reference value
CT exposure diff Δ	Absolute difference between measured value and reference value
CT exposure diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.18.1 Set CT exposure (Set value)

This is the CT exposure (CT dose) set value. This value is the reference value when calculating the inaccuracy of CT exposure.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (CT exposure)

3.2.5.18.2 CT exposure (Measured)

This is the measured CT exposure (CT dose). There are several detectors that can measure CT exposure (CT dose). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating the CTDI and inaccuracy of CT exposure.

This column or is required for the following analysis
CTDI
Accuracy (CT exposure)
Reproducibility (CT exposure)

3.2.5.18.3 CT exposure diff % (Calculated)

This is the calculated inaccuracy (relative) for CT exposure (CT dose).

The following calculation is done on each row included in the analysis:

CT exposure diff % = **100 * (** CT exposure (Measure) - Set CT exposure **) /** Set CT exposure

This column is required for the following analysis
Accuracy (CT exposure, relative)

3.2.5.18.4 CT exposure diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for CT exposure (CT dose).

The following calculation is done on each row included in the analysis:

CT exposure diff Δ = CT exposure (Measured) - Set CT exposure

This column is required for the following analysis
Accuracy (CT exposure, absolute)

3.2.5.18.5 CT exposure diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of CT exposure (CT dose). The mean value is calculated based on the measured CT exposure for all rows included in the reproducibility analysis.

The mean value is calculated as:

CTexp mean = **(CT exp$_1$ + CT exp$_2$ + ... + CT exp$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

CT exposure diff from mean (%) = **100 * (** CT exposure (Measured) **- CT exp mean) / CT exp mean**

This column is required for the following analysis
Reproducibility (CT exposure)

3.2.5.19 CT exposure rate

This group of columns is related to the measurement of CT exposure rate (CT dose rate):

Set CT exposure rate	Set value
CT exposure rate	Measured value
CT exposure rate diff %	Relative difference between measured value and reference value
CT exposure rate diff Δ	Absolute difference between measured value and reference value
CT exposure rate diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.19.1 Set CT exposure rate (Set value)

This is the CT exposure rate (CT dose rate) set value. This value is the reference value when calculating the inaccuracy of CT exposure rate.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (CT exposure rate)

3.2.5.19.2 CT exposure rate (Measured)

This is the measured CT exposure rate (CT dose rate). There are several detectors that can measure CT exposure rate (CT dose rate). You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating inaccuracy and reproducibility of CT exposure rate.

This column or is required for the following analysis
Accuracy (CT exposure)
Reproducibility (CT exposure)

3.2.5.19.3 CT exposure rate diff % (Calculated)

This is the calculated inaccuracy (relative) for CT exposure rate (CT dose rate).

The following calculation is done on each row included in the analysis:

CT exposure rate diff % = **100 * (** CT exposure rate (Measure) - Set CT exposure rate **) /** Set CT exposure rate

This column is required for the following analysis
Accuracy (CT exposure rate, relative)

3.2.5.19.4 CT exposure rate diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for CT exposure rate (CT dose rate).

The following calculation is done on each row included in the analysis:

CT exposure rate diff Δ = CT exposure rate (Measured) - Set CT exposure rate

This column is required for the following analysis
Accuracy (CT exposure rate, absolute)

3.2.5.19.5 CT exposure rate diff from mean (%) (Calculated)

It is the calculated relative difference from the mean value of CT exposure rate (CT dose rate). The mean value is calculated based on the measured CT exposure rate of all rows included in the reproducibility analysis.

The mean value is calculated as:

CT exp rate mean = **(CT exp rate$_1$ + CT exp rate$_2$ + ... + CT exp rate$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

CT exposure rate diff from mean (%) = **100 * (** CT exposure rate (Measured) **- CT exp rate mean) / CT exp rate mean**

This column is required for the following analysis
Reproducibility (CT exposure rate)

3.2.5.20 DAP exposure

This group of columns is related to the measurement of DAP exposure:

Set DAP exposure	Set value
DAP exposure	Measured value
DAP exposure diff %	Relative difference between measured value and reference value
DAP exposure diff Δ	Absolute difference between measured value and reference value
DAP exposure diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.20.1 Set DAP exposure (Set value)

This is the DAP exposure set value. This value is the reference value when calculating the inaccuracy of DAP exposure.

You can have only one instance of this column.

This column is required for the following analysis
Accuracy (DAP exposure)

3.2.5.20.2 DAP exposure (Measured)

This is the measured DAP exposure. You can have several instances of this column for different detectors (or several instances for the same detector) and just to show the measured values in different units. This value is used when calculating the inaccuracy or reproducibility of DAP exposure.

This column or is required for the following analysis
Accuracy (DAP exposure)
Reproducibility (DAP exposure)

3.2.5.20.3 DAP exposure diff % (Calculated)

This is the calculated inaccuracy (relative) for DAP exposure.

The following calculation is done on each row included in the analysis:

DAP exposure diff % = **100 * (** DAP exposure (Measure) - Set DAP exposure **) /** Set DAP exposure

This column is required for the following analysis
Accuracy (DAP exposure, relative)

3.2.5.20.4 DAP exposure diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for DAP exposure.

The following calculation is done on each row included in the analysis:

DAP exposure diff Δ = DAP exposure (Measured) - Set DAP exposure

This column is required for the following analysis
Accuracy (DAP exposure, absolute)

3.2.5.20.5 DAP exposure diff from mean (%) (Calculated)

This is the calculated relative difference from the mean value of DAP exposure (DAP dose). The mean value is calculated based on the measured DAP exposure of all rows included in the reproducibility analysis.

The mean value is calculated as:

DAP exp mean = **(DAP exp$_1$ + DAP exp$_2$ + ... + DAP exp$_n$) / n** (based on rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

DAP exposure diff from mean (%) = **100 * (** DAP exposure (Measured) **- DAP exp mean) / DAP exp mean**

This column is required for the following analysis
Reproducibility (DAP exposure)

3.2.5.21 DAP exposure rate

This group of columns is related to the measurement of DAP exposure rate:

Set DAP exposure rate	Set value
DAP exposure rate	Measured value
DAP exposure rate diff %	Relative difference between measured value and reference value
DAP exposure rate diff Δ	Absolute difference between measured value and reference value
DAP exposure rate diff from mean (%)	Relative difference between measured value and the mean value

3.2.5.21.1 Set DAP exposure rate (Set value)

This is the DAP exposure rate set value. This is the reference value when calculating the inaccuracy of DAP exposure rate.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (DAP exposure rate)

3.2.5.21.2 DAP exposure rate (Measured)

This is the measured DAP exposure rate. You can have several instances of this column for different detectors or the same detector and just to show measured values in different units. This value is used when calculating inaccuracy and reproducibility of DAP exposure rate.

This column or is required for the following analysis
Accuracy (DAP exposure)
Reproducibility (DAP exposure)

3.2.5.21.3 DAP exposure rate diff % (Calculated)

This is the calculated inaccuracy (relative) for DAP exposure rate.

The following calculation is done on each row included in this analysis:

DAP exposure rate diff % = **100 * (** DAP exposure rate (Measure) - Set DAP exposure rate **) /** Set DAP exposure rate

This column is required for the following analysis
Accuracy (DAP exposure rate, relative)

3.2.5.21.4 DAP exposure rate diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for DAP exposure rate.

The following calculation is done on each row included in this analysis:

DAP exposure rate diff Δ = DAP exposure rate (Measured) - Set DAP exposure rate

This column is required for the following analysis
Accuracy (DAP exposure rate, absolute)

3.2.5.21.5 DAP exposure rate diff from mean (%) (Calculated)

This the calculated relative difference from the mean value of DAP exposure rate. The mean value is calculated based on the measured DAP exposure rate of all rows included in the reproducibility analysis.

It is calculated in the following way:

The mean value is calculated as:

DAP exp rate mean = **(DAP exp rate$_1$ + DAP exp rate$_2$ + ... + DAP exp rate$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

DAP exposure rate diff from mean (%) = **100 * (** DAP exposure rate (Measured) **- DAP exp rate mean) / DAP exp rate mean**

This column is required for the following analysis
Reproducibility (DAP exposure rate)

3.2.5.22 User-defined calculation

This group of columns is related to the user-defined calculation:

Set User Calculation	Set value
User Calculation	Value calculated with a user-defined formula
User Calculation value diff %	Relative difference between calculated value and reference value
User Calculation value diff Δ	Absolute difference between calculated value and reference value
User Calculation diff from mean (%)	Relative difference between calculated value and the mean value

3.2.5.22.1 Set User Calculation (Set value)

This is the user-calculation set value. It is the reference value when calculating the inaccuracy of the user-calculated value.

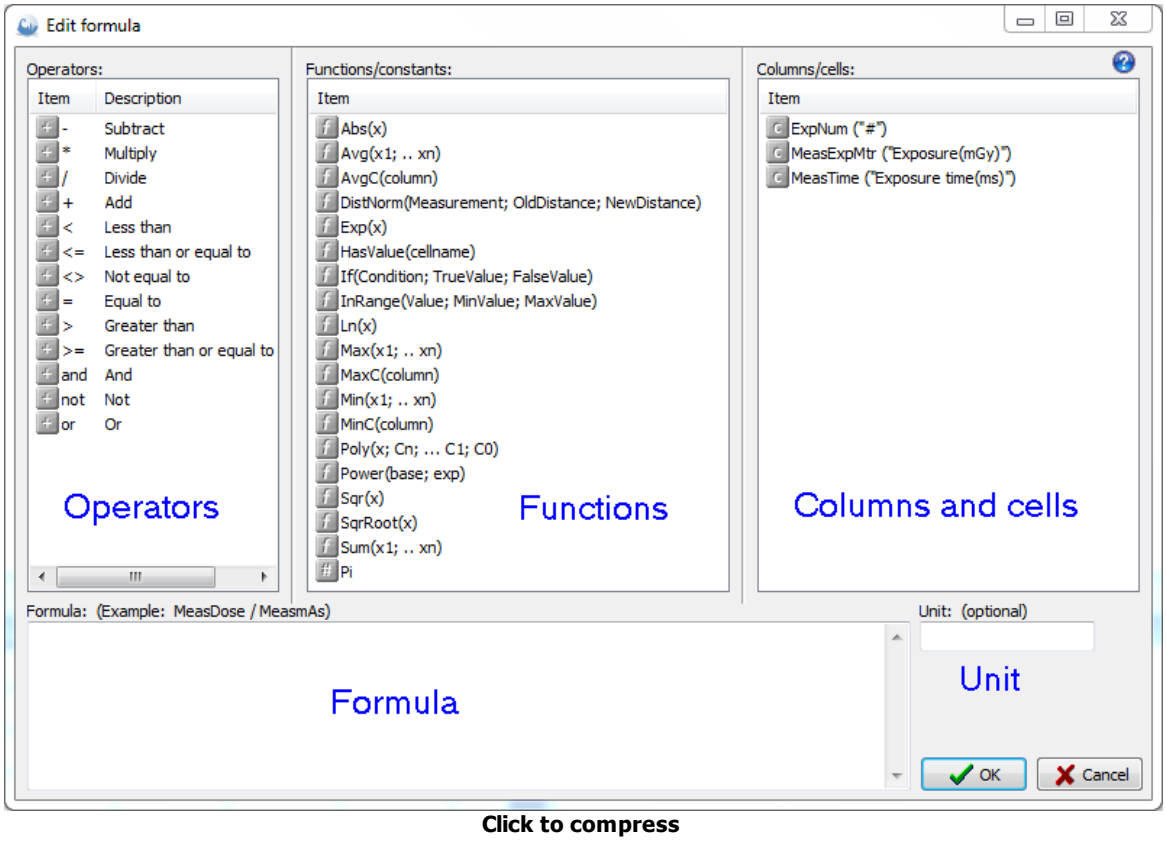
You can only have one instance of this column.

This column is required for the following analysis
Accuracy (User-calculation)

3.2.5.22.2 User Calculation (Calculated)

This column shows the results of a user-defined formula belonging to this column. If you have this column in your test you can use any values present in the grid and your own formula to calculate a value. Read how to add a user calculation in the topic Add a user calculation.

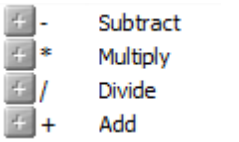
There are several operations and functions available for you to use in your own formulas:



Click to compress

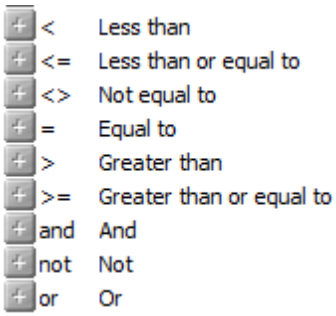
This dialogue is shown when you are specifiying a formula for a column or for an individual cell.

Numeric operators



These operators are used to perform numeric operations.

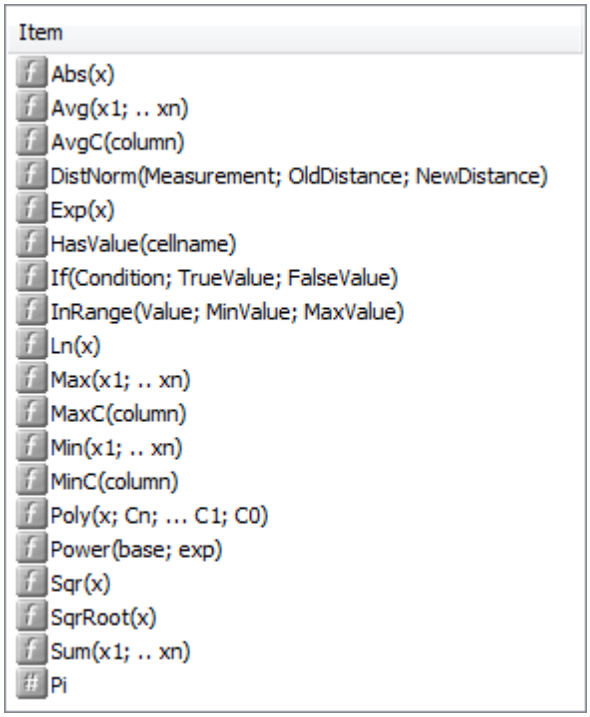
Logical operators



These operators are used in the IF-function to specify the "Condition". See examples below.

Functions

Several predefined functions are available to perform different calculations:



Abs(x)

This function gives the absolute value of a parameter.

Avg(x1;....xn)

This function returns the average of the values x1, x2, ...,xn.

AvgC(column)

This function is returns the average of all values in a column.

DistNorm(Measurement; OldDistance; NewDistance)

This function is used to normalize a value (normally an exposure or an exposure rate value) to a different distance as

$$\text{Normalized value} = Measurement * (OldDistance / NewDistance)^2$$

Exp(x)

This is the exponential function e^x.

If(Condition; TrueValue; FalseValue)

This conditional function that makes it possible to evaluate the value depending on the "Condition". The Condition statement can contain cell names, column names and logical operators. The TrueValue and FalseValue can be another function, a calculation or a value (in all cases must the type be numerical).

Example:
Assume that you have the following measurement:

View / Select	#	Calibration	Set kV (kV)	Exposure (mGy)
	1	Mo/30 µm Mo	24	0,7393
	2	Mo/30 µm Mo	26	0,9635
	3	Mo/30 µm Mo	28	1,207
	4	Mo/30 µm Mo	30	1,465
	5	Mo/30 µm Mo	32	1,760

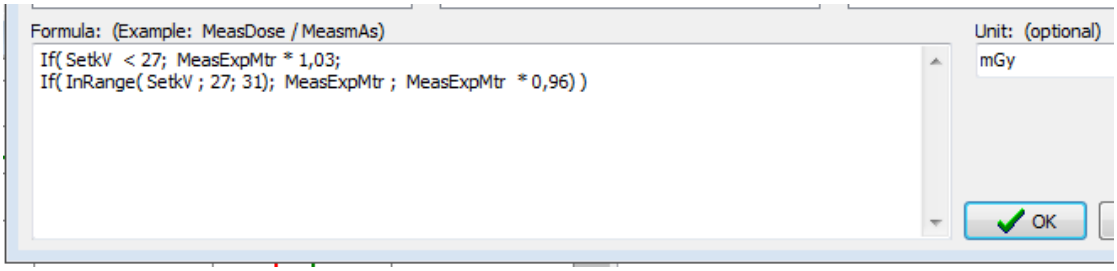
You want to add the following compensation to the measured Exposure values:

For kV lower that 27 kV - multiply with 1.03
For kV between 27 and 31 kV - multiply with 1.00
For kV above 31 kV - multiply with 0.96

Add the User Calculation column. Change the title to "Compensated Exposure":

View / Select	#	Calibration	Set kV (kV)	Exposure (mGy)	Compensated Exposure
	1	Mo/30 µm Mo	24	0,7393	
	2	Mo/30 µm Mo	26	0,9635	
	3	Mo/30 µm Mo	28	1,207	
	4	Mo/30 µm Mo	30	1,465	
	5	Mo/30 µm Mo	32	1,760	

Now add the formula. Right-click on the heading of the user calculation column and add the following formula and unit:
(note the line break after "1,03;" is only for better readability and is not required)


Formula: (Example: MeasDose / MeasmAs)
If(SetkV < 27; MeasExpMtr * 1,03;
If(InRange(SetkV ; 27; 31); MeasExpMtr ; MeasExpMtr * 0,96))
Unit: (optional)
mGy
OK

Click to compress

Now it looks like this:

View / Select	#	Calibration	Set kV (kV)	Exposure (mGy)	Compensated Exposure (mGy)
	1	Mo/30 µm Mo	24	0,7393	0,7614
	2	Mo/30 µm Mo	26	0,9635	0,9924
	3	Mo/30 µm Mo	28	1,207	1,207
	4	Mo/30 µm Mo	30	1,465	1,465
	5	Mo/30 µm Mo	32	1,760	1,690

InRange(Value; MinValue; MaxValue)

This function returns True if Value is within the range specified by MinValue and MaxValue, otherwise False.

Ln(x)

This is the inverse of the exponential function e^x.

Max(x1;...;xn)

This function returns the maximum of the values x1, x2, ..., xn. x can be individual cells or columns.

MaxC(column)

This function returns the maximum value in the specified column.

Min(x1;...;xn)

This function returns the minimum of the values x1, x2, ..., xn. x can be individual cells or columns.

MinC(column)

This function returns the minimum value in the specified column.

Poly(x; Cn; .....; C1; C0)

This function returns the value of the polynomial function:

$C0 + C1*x + C2*x^2 + ... + Cn*x^n$

maximum value for n is 6.

Power(Base; exp)

This function calculates the value of $Base^{exp}$.

Sqr(x)

This function calculates x^2. x can be individual cell or column.

SqrRoot(x)

This function calculates v x. x can be individual cell or column.

Sum(x1;...;xn)

This function calculates the sum of x1, ..., xn. x can be individual cells or columns.

Pi

This functions returns the value π (3,141592653589793).

Columns and cells

Here are column names and cell names shown. If you give your own name to a cell or a column, it shows up here. You can easily pick from this list when you create your own formulas.

3.2.5.22.3 User Calculation value diff % (Calculated)

This is the calculated inaccuracy (relative) for user-defined calculation.

The following calculation is done on each row included in the analysis:

User calculation diff % = **100 * (** User calculation(Calculated) - Set User Calculation **) /** Set User Calculation

This column is required for the following analysis
Accuracy (User calculation, relative)

3.2.5.22.4 User Calculation value diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for user-defined calculation.

The following calculation is done on each row included in the analysis:

kVp diff Δ = User Calculation (Calculated) - Set User Calculation

This column is required for the following analysis
Accuracy (User Calculation, absolute)

3.2.5.22.5 User Calculation diff from mean (Calculated)

This is the calculated relative difference from the mean value of user-calculated values. The mean value is calculated based on the measured value of all rows included in the reproducibility analysis.

This value is calculated according to the following formula:

The mean value is calculated as:

user calc mean = **(value$_1$ + value$_2$ + ... + value$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

User calculation diff from mean (%) = **100 * (** User calculation **- user calc mean) / user calc mean**

This column is required for the following analysis
Reproducibility (for user calculated values)

3.2.5.23 User-defined numeric value

This group of columns is related to the user-defined calculation:

Numeric set value	Set value
Numeric value	Value calculated with a user-defined formula
Numeric value diff %	Relative difference between calculated value and reference value
Numeric value diff Δ	Absolute difference between calculated value and reference value
Numeric value diff from mean (%)	Relative difference between calculated value and the mean value

3.2.5.23.1 Numeric set value (Set value)

This is the user-defined numeric set value. It is the reference value when calculating the inaccuracy of the user-defined numeric value.

You can only have one instance of this column.

This column is required for the following analysis
Accuracy (Numeric value)

3.2.5.23.2 Numeric value (Measured)

This is a user-defined numeric measured value. You can use this column to store any numeric (measured) value you enter from the keyboard.

This value is a measured value and it will not be stored as measured data.

3.2.5.23.3 Numeric value diff % (Calculated)

This is the calculated inaccuracy (relative) for user-defined numeric value.

The following calculation is done on each row included in the analysis:

User calculation diff % = **100 * (** Numeric value(Measured) - Numeric set value **) /** Numeric set value

This column is required for the following analysis
Accuracy (User defined numeric value, relative)

3.2.5.23.4 Numeric value diff Δ (Calculated)

This is the calculated inaccuracy (absolute) for user-defined numeric value.

The following calculation is done on each row included in the analysis:

Numeric value diff Δ = Numeric value (Measured) - Numeric set value

This column is required for the following analysis
Accuracy (Numeric value, absolute)

3.2.5.23.5 Numeric value diff from mean (Calculated)

This is the calculated relative difference from the mean value of user-defined numeric values. The mean value is calculated based on the measured value of all rows included in the reproducibility analysis.

This value is calculated according to the following formula:

The mean value is calculated as:

user calc mean = **(value$_1$ + value$_2$ + ... + value$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

User calculation diff from mean (%) = **100 * (** Numeric value **- user calc mean) / user calc mean**

This column is required for the following analysis
Reproducibility (for numeric values)

3.2.5.24 Settings

This group of columns is related to different settings (Added filtration, compression paddle, beam correction factor and calibration).

Set Added filtr.	Added filtration (used for example for HVL)
Compr. paddle	Compression paddle status
Beam corr. factor	Beam correction factor (optional correction factor for exposure and exposure rate)
Calibration	Shows selected calibration for a detector

3.2.5.24.1 Set Added filtr. (Set value)

This column (it can also be in general settings) is specifying the amount of added filtration. It can be used for different purposes but normally you would use it when you are doing an HVL measurement to specify the amount of aluminum you add. It can also be used to increase accuracy of measured kVp and dose/dose rate when the meter is unable to estimate the amount of filtration or you are using a detector that doesn't have automatic energy correction.

You can also set this parameter on the Meter adjust tabs (unless you are doing an HVL calculation). It is found on tabs for RTI kVp and dose detectors. This value is specific for each detector used in a test or real-time display.

This column is required for the following analysis
HVL

3.2.5.24.2 Compr. paddle (Selection)

This column (it can also be in general settings) is specifying if the compression plate is present or not. This column is relevant only for mammography measurements.

You can also set this parameter on the Meter adjust tabs. It is found on tabs for RTI kVp and dose detectors. This value is specific for each detector used in a test or real-time display.

This column is required for the following analysis
not required for any analysis

3.2.5.24.3 Beam corr. factor (Set value)

This column (or in general settings) is specifying a factor that measured exposure and exposure rate is multiplied with. This column can be used to apply a correction to a measured exposure or exposure rate value.

You can also set this parameter on the Meter adjust tabs. It is found on tabs corresponding to all type of exposure detectors. This value is specific for each detector used in a test or real-time display.

This column is required for the following analysis
not required for any analysis

3.2.5.24.4 Calibration (Selection)

This is column is specifying the calibration used for corresponding detector.

You can set this value on the Meter adjust tabs in situations where it is not important to see what calibration is used. For example, when doing radiography, fluoroscopy and dental measurements, only one calibration is available. However, when doing mammography measurements, there are several different calibrations available and it may be useful to easily see the calibration being used for the measurement. This setting is also found on the meter adjust tabs for the RTI kVp and dose detectors. This value is specific for each detector used in a test or real-time display.

This column is required for the following analysis

AGD(ACR)
AGD(EUREF)
AGD(IAEA)

3.2.5.24.5 Measuring time

This column is specifying if the measuring time for **Timed Mode**.

You can also set this parameter on the Meter adjust tabs. It is found on the Meter tab when Timed Mode is activated. This value is specific for each row in the test or real-time display.

This column is required for the following analysis
not required for any analysis but normally used for CT Dose Profiler analysis

3.2.5.25 Conditions

This group of columns is related to different measuring conditions (for example SSD, SDD, focal spot and more).

Temperature	Temperature (used for TP compensation of ion chamber readings)
Pressure	Pressure (used for TP compensation of ion chamber readings)
SSD	Source-Skin-Distance (used for normalization of exposure and exposure rate readings)
SDD	Source-Detector-Distance (used for normalization of exposure and exposure rate readings)
Focal spot	Indicates focal spot (if present it is used by the mA linearity analysis)
CT phantom position	Indicates CT pahntom position (used by the CTDI analysis)
Slice Thickness	CT slice thickness (used by the CTDI analysis)
Number of slices	Number slices (used by the CTDI analysis)
Pitch	Pitch value

3.2.5.25.1 Temperature (Set value)

This is the set value for temperature. It is used to calculate the TF-factor used to compensate readings from ion chambers. Normally you would place this parameter in the general settings.

3.2.5.25.2 Pressure (Set value)

This is the set value for pressure. It is used to calculate the TF-factor used to compensate readings from ion chambers. Normally you would place this parameter in the general settings.

3.2.5.25.3 SSD (Set value)

This is the Source Skin Distance. It is used when calculating the normalized exposure or exposure rate.

The normalized exposure is calculated as:

Exposure (norm) (Measured) = Exposure (Measured) *** (** SDD (Set value) **/** SDD (Set value) **)^2 * (** Ref mAs **/** Set mAs **)**

or

Exposure rate (norm) (Measured) = Exposure rate (Measured) *** (** SDD (Set value) **/ SSD (Set value))^2 * (** Ref mAs **/** Set mAs **)**

If any of the values SDD, SDD, Ref mAs or Set mAs are missing the following formula is used:

Exposure (norm) (Measured) = Exposure (Measured) or Exposure (norm) (Measured) = Exposure rate (Measured)

3.2.5.25.4 SDD (Set value)

This is the Source Detector Distance. It is used when calculating the normalized exposure or exposure rate.

The normalized exposure is calculated as:

Exposure (norm) (Measured) = Exposure (Measured) *** (** SDD (Set value) **/** SDD (Set value) **)²** *** (** Ref mAs **/** Set mAs **)**

or

Exposure rate (norm) (Measured) = Exposure rate (Measured) *** (SDD (Set value) /** SSD (Set value) **)²** *** (** Ref mAs **/** Set mAs **)**

If any of the values SDD, SDD, Ref mAs or Set mAs are missing the following formula is used:

Exposure (norm) (Measured) = Exposure (Measured) or Exposure (norm) (Measured) = Exposure rate (Measured)

3.2.5.25.5 Focal spot (Set value)

This is the focal spot size. The parameter can have three different values; "Small", Medium" or "Large". It is not required for any analysis but the mA linearity analysis takes the focal spot into account if this parameter is present.

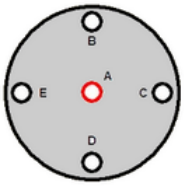
3.2.5.25.6 Density (Set value)

This is the AEC set densitiy value. It is use for AEC density correction analysis.

This column is required for the following analysis
AEC density correction (Exposure or O.D.).

3.2.5.25.7 CT phantom position (Set value)

This is the CT phantom position. This parameter is used when doing CTDI analysis. It can have six different values:



A (center)
B (12 o'clock)
C (3 o'clock)
D (6 o'clock)
E (9 o'clock)

This column is required for the following analysis
CTDI

3.2.5.25.8 Slice Thickness (Set value)

This is the CT slice thickness. It is used for the CTDI analysis.

This column is required for the following analysis
CTDI

3.2.5.25.9 Number of slices (Set value)

This is the number of slices. It is used for the CTDI analysis.

This column is required for the following analysis
CTDI

3.2.5.25.10 Pitch (Set value)

This is the pitch. It is used to calculate CTDI volume for a helical scan.

3.2.5.25.11 Scan time (Set value)

This is the CT scan time. It is used for the CTDI analysis with the CT Dose Profiler detector. Default unit is seconds.

This column is required for the following analysis
CTDI(helical scan/in phantom)
CTDI(helical scan/free-in-air)

3.2.5.25.12 K-factor (Set value)

The k-factor is used to calculate weighted CTDI from $CTDI_{100}$ measured in the center hole of the phantom:

$$CTDI_w = CTDI_{100,c} * k$$

The k-factors has been determined for a large number of CT scanners by measurement of $CTDI_{100}$ in the center and in the peripheral holes. A factor (the k-factor) between the weighted CTDI and the CTDI in the center hole has been determined for each scanner model. The factor has been determined for different kV and for head and body phantom, respectively.

The analysis CTDI(helical scan/in phantom) will automatically look up the appropriate k-factor depending on specified values and use that for the calculation of weighted CTDI. THis column is optional but will override the automatic lookup if it is used in the test.

3.2.5.25.13 Scan length (Set value)

This is the CT scan length. Default unit is millimeters.

This column is required for the following analysis
It is not required for any analysis.

3.2.5.25.14 Tube rotation time (Set value)

This is the CT tube rotation time. It is used for the CTDI analysis with the CT Dose Profiler detector. Default unit is seconds.

This column is required for the following analysis
CTDI(helical scan/in phantom)
CTDI(helical scan/free-in-air)

3.2.5.25.15 Collimation (Set value)

This is the CT collimation. It is used for the evaluation of Geometric Efficiency with the CT Dose Profiler detector. Default unit is millimeters.

This column is required for the following analysis
CTDI(helical scan/in phantom)

CTDI(helical scan/free-in-air)

3.2.5.25.16 CT phantom type (Set value)

This value specifies the type of CT phantom used. It is used for the CTDI analysis with the CT Dose Profiler detector. It can have three different values **Head**, **Body** and **Free-in-air**.

This column is required for the following analysis
CTDI(helical scan/in phantom)
CTDI(helical scan/free-in-air)

3.2.5.26 Testing

This group of columns is related to analysis and calculations used in analysis:

HVL(AGD)	This is the HVL value used for the AGD calculation
Ratio	This is the ratio between the measured exposure when filtration is added compared to the exposure value with no added filtration.
Ratio[rate]	This is the ratio between the measured exposure when filtration is added compared to the exposure value with no added filtration.
Diff from ref. val.	This column is not used in this version of Ocean.
Value/Average	This column is not used in this version of Ocean.
CTDI	This is the calculated CTDI value (for each phantom position).
Analysis comment	A special column used by the analysis.
Exposure/Set mAs	Calculated value Exposure/set mAs is used by mA linearity analysis
Exposure/meas mAs	Calculated value Exposure/meas mAs is used by mA linearity analysis
Ref mAs	Reference mAs is used for the AGD calculation according to the IAEA protocol
Phantom	Pantom thickness (sed by the AGD calculation according to the EUREF protocol)
AGD	This is the calculated AGD value

3.2.5.26.1 Scan speed (Calculated)

Scan speed is calculated as:

Scan speed = (Pitch * Collimation) / Tube rotation time

It is used to create a room scale that is related to the time scale.

This column is required for the following analysis
CTDI(helical scan/in phantom)
CTDI(helical scan/free-in-air)

3.2.5.26.2 HVL(AGD) (Measured)

This is a set value column. This column is required when average glandular dose is calculated. You must enter this value.

This column is required for the following analysis
AGD(ACR)
AGD(EUREF)
AGD(IAEA)

3.2.5.26.3 Ratio (Calculated)

This column is a calculated value and it can be used in an HVL test. It takes the exposure for the row where Set added filtr. = 0 and calculates the ratio of the measured exposure and the value where no filtration is added. This column is optional, but it must not be selected for the HVL analysis.

The following calculation is done on each row included in the analysis:

Ratio = 100 * Exposure (Measured) **/ "Exposure (Measured) at 0 mm Al"**

3.2.5.26.4 Ratio[rate] (Calculated)

This column is a calculated value and it can be used in an HVL test. It takes the exposure rate for the row where Set added filtr. = 0 and calculates the ratio of the measured exposure rate and the value where no filtration is added. This column is optional, but it must not be selected for the HVL analysis.

The following calculation is done on each row included in the analysis:

Ratio = 100 * Exposure rate (Measured) **/ "Exposure rate (Measured) at 0 mm Al"**

3.2.5.26.5 Diff from ref. val. (%) (Calculated)

This column is used for the AEC density correction analysis. It is the calculated relative difference from a reference exposure value. The reference value is the exposure measured when the density correction is set to "0".

The reference value, **Exposure ref**, is measured exposure when density correction is set to "0". The column used is Set density(Set value).

The following calculation is done on each row included in the AEC density correction analysis:

Diff from ref val (%)= = **100 * (** Exposure (Measured) **- Exposure ref) / Exposure ref**

This column is required for the following AEC analysis if measured exposure is used
AEC density correction (Exposure)

3.2.5.26.6 Value/Average (Calculated)

This column is not used in this version of Ocean.

3.2.5.26.7 CTDI (Calculated)

This is the CTDI value calculated for each phantom position. The calculated $CTDI_{(100,w)}$ (weighted CTDI) is presented by the CTDI analysis.

CTDI of an individual position is calculated as follows:

$CTDI_{(100,A(or\,B\,C\,D\,E))}$ = Measured CTdose / (N × h)

where

N is the number of slices
h is the slice thickness

This column is required for the following analysis
CTDI

3.2.5.26.8 Analysis comment (Calculated)

This column is a text column generated by the analysis. You can read in the topic Analysis comment to learn how to use it. This column is not required to use an analysis.

3.2.5.26.9 Exposure/Set mAs (Calculated)

This column is used by the mA linearity analysis. It shows the calculated exposure per mAs value when the mAs set (or set mA and set time) value is used in the mA linearity evaluation.

The following calculation is done on each row included in the analysis:

Exposure/Set mAs **=** Exposure (Measured) / Set mAs

or

Exposure/Set mAs **=** Exposure (Measured) / (Set mA * Set time)

This column is required for the following analysis
mA linearity (if evaluated based on Set mAs or Set mA and time)

3.2.5.26.10 Exposure/meas mAs (Calculated)

This column is used by the mA linearity analysis. It shows the calculated exposure per mAs value when measured mAs (or measured mA and time) is used in the mA linearity evaluation.

The following calculation is done on each row included in the analysis:

Exposure/meas mAs **=** Exposure (Measured) / mAs (Measured) (Measured)

or

Exposure/meas mAs **=** Exposure (Measured) **/ (** mA (Measured) * Time (Measured) **)**

This column is required for the following analysis
mA linearity (if evaluated based on measured mAs or measured mA and time)

3.2.5.26.11 Ref mAs (Set value)

This column is used by the AGD(EUREF) and the AGD(IAEA) analyses. It is used together with the Set mAs (Set value) to normalize the exposure value used in the average glandular dose calculation.

The normalized exposure is calculated as:

Exposure (norm) (Measured) = Exposure (Measured) *** (** SDD (Set value) **/** SDD (Set value) **)^2 * (** Ref mAs **/** Set mAs **)**

or

Exposure rate (norm) (Measured) = Exposure rate (Measured) *** (** SDD (Set value) **/** SSD (Set value) **)^2 * (Ref mAs /** Set mAs **)**

If the values SDD/SSD and Ref mAs/Set mAs are missing, the following formula is used:

Exposure (norm) (Measured) = Exposure (Measured) or Exposure (norm) (Measured) = Exposure rate (Measured)

3.2.5.26.12 Phantom (Set value)

This value is used by the AGD(EUREF) analysis. It specifies the PMMA thickness used.

This column is required for the following analysis
AGD(EUREF)

3.2.5.26.13 Field selection (Set value)

This value is used by the AEC field balance analysis. It specifies the AEC field(s) used.

This column is required for the following analysis
AEC field balance

3.2.5.26.14 AGD (Calculated)

This value is the calculated average glandular dose. This column is required for all types of AGD analysis.

For the calculation of AGD, the half value layer value is required. You can use a value from a tradional HVL measurement (by adding filters until you have decreased the measured dose to less than half) or use the Qick HVL that the meter gives for each exposure. If you use the later, you can get the AGD with only one exposure.

This column is required for the following analysis
AGD(ACR)
AGD(EUREF)
AGD(IAEA)

3.2.5.26.15 Result (Calculated)

If this column is present it shows "Pass" or "Fail" for each row. It will look at all analysis that evaluates this row and indicate "Pass" if all analysis pass that row. If at least one analysis fails the row, the column will indicate "Fail".

3.2.5.27 Other

There are various columns found in this group, for example Date/time, Position check and more.

Attachments	A column where files can be attached to a row.
Memo	Formatted comments can be entered in this column.
Date/time	Shows the date and time for each exposure.
Position check	Shows the result from the position check.
Meas O.D.	Measured optical density
Diff from mean (O.D.)	Difference from mean for optical density
Diff from ref val (O.D.)	Difference from reference value for optical density
Charge	This column is related to measurements of charge.
Current	This column is related to measurements of current.
Beam Quality Index	Beam quality index is a ratio value that is reflecting the beam quality.
Waveform data	Shows waveform data in the grid

3.2.5.27.1 Attachments (Measured)

You can add attachments in this column. They can be pictures, documents and so on. The the files you put here are stored in the session or real-time display. Files you put here are considered to be "measured data", they are not saved in a template and they are erased if you do "Clear data".

NOTE: This column is not supported in the report.

3.2.5.27.2 Memo (Measured)

You can write formatted text in this column. The text you put here is considered to be "measured data" so it is not saved in a template and is erased if you do "Clear data".

NOTE: This column is not supported in the report.

3.2.5.27.3 Date/time (Calculated)

If this column is present it shows the date and time of every exposure made in a test or real-time display.

3.2.5.27.4 Position check (Measured)

The results of the position check is presented in this column. It is possible to see if a position check has been done and if it passed or failed. This can be used in situations where detector positioning is critical to the success of a measurement to make sure that a position check has been done and that the measurement was done correctly.

3.2.5.27.5 Meas O.D. (Measured)

This is the measured optical densitiy. This value is entered from the keyboard. This value is used for AEC performance analysis.

This column is required for the following analysis
AEC kV compensation (O.D.)
AEC mA compensation (O.D.)
AEC reproducibility (O.D.)
AEC reciprocity (O.D.)
AEC field balance (O.D.)
AEC density correction (O.D.)

3.2.5.27.6 Diff from mean (O.D.) (Calculated)

It is the calculated relative difference from the mean value of measured optical density. The mean value is calculated based on the optical density of all rows included in the AEC analysis.

The mean value is calculated as:

O.D. mean = **(Meas O.D.$_1$ + Meas O.D.$_2$ + ... + Meas O.D.$_n$) / n** (based on all rows included in the reproducibility analysis)

and the following calculation is done on each row included in the reproducibility analysis:

Diff from mean (O.D.) = Meas O.D. (Measured) **- O.D. mean**

This column is required for the following AEC analysis if optical density is used
AEC kV compensation (O.D.)
AEC mA compensation (O.D.)
AEC reproducibility (O.D.)
AEC reciprocity (O.D.)
AEC field balance (O.D.)
AEC density correction (O.D.)

3.2.5.27.7 Diff from ref. val (O.D.) (Calculated)

This column is used for the AEC density correction analysis. It is the calculated difference from a reference optical density value. The reference value is the optical density measured when the density correction is set to "0".

The reference value, **O.D. ref,** is measured optical density when density correction is set to "0". The column used is Set density(Set value).

The following calculation is done on each row included in the AEC density correction analysis:

Diff from ref val (O.D.)= = Meas O.D. (Measured) **- O.D. ref**

This column is required for the following AEC analysis if optical density is used
AEC density correction (O.D.)

3.2.5.27.8 Charge

This is the measured charge from a detector.

3.2.5.27.9 Current

This is the measured current from a detector.

3.2.5.27.10 Beam Quality Index

Beam quality index ratio is a value that is reflecting the beam quality. It is not calibrated in any way and not used by Ocean.

3.2.5.27.11 Waveform data

This column is used to show waveform data in the grid. All parameters shown on the waveform data panel can be shown in this column.

You can read in the topic Waveform data in a column how to use this column.

3.2.5.28 User-defined text

The list below is showing all the user-defined columns available to you:

Set text	This is a user-defined set text (the text you type in this column is assumed to be "set values".
Text	This is a user-defined "measured" text (the text you type in this column is assumed to be "measured values".

3.2.5.28.1 Set text (Set value)

This is a user-defined set text string. You can use this column (or general setting) for any text set value you may want in a test.

This text is a set value and it will be stored in your templates.

3.2.5.28.2 Text (Measured)

This is a user-defined "measured" text value. You can use this column to store any text you enter from the keyboard.

This text is a measured value and it will not be stored in your templates.

3.2.6 Analysis (Definitions)

An analysis is a pre-defined calculation that is applied to the grid. You can include all rows or just rows you select in the analysis. You can for each analysis define your own pass/fail limits.

There are several different analysis available:

Accuracy	Evaluates the accuracy for all measured parameters. It calculates the deviation between a measured value and a set value (reference value) and compares against specified pass/fail criteria.
Reproducibility	Evaluates the reproducibility for all measured parameters. It calculates difference from mean value, coefficient of variation and standard deviation.
mA linearity	Evaluates the mA linearity. It compares the mA/expsure value for the different mA stations. It can be used both with mA/time and mAs generators.
HVL	Calculates half value layer based on a number of exposures with increasing added filtration. Calculated half value layer is compared to specified pass/fail criteria.
QuickHVL	Compares the direct measured half value layer with specified pass/fail criteria.
CTDI	Calculates CTDI based on five CT dose values measured in different positions in a CT phantom. It calculates CTDI, weighted CTDI and normalized CTDI.
CTDI(helical scan/in phantom)	Calculates CTDIw, CTDIvol and DLP from a helical scan and a measurement in the center hole of the phantom using the RTI CT Dose Profiler detector.
CTDI(helical scan/ free-in-air)	Calculates Geometric efficiency from a helical scan free-in-air using the RTI CT Dose Profiler detector.
AGD(ACR)	Calculates average glandular dose according to the rules specified by *ACR, Mammography Quality Manual, 1999, ISBN 1-55903-142-5*. Required input is an HVL value, a entrance kerma dose value and the target/filter used.
AGD(EUREF)	Calculates average glandular dose according to the rules specified by *European Protocol for the Quality Control of the Physical and Technical Aspects of Mammography Screening, Appendices, page 110, 2005*. Required input is an HVL value, a entrance kerma dose value, the target/filter used and phantom thickness.
AGD(IAEA)	Calculates average glandular dose according to the rules specified by *IAEA, Technical Reports Series no 457, Dosimetry in Diagnostic Radiology: An International code of Practice, page 155-163, 2007, ISSN 0074-1914; no 457*. Required input is an HVL value, a entrance kerma dose value and the target/filter used.
Min/Max	Compares specified parameter with a high and/or low accepted limit. It can be used with all measured parameters and the user-calculation column.
Checklist	Presents the result for a checklist, if it passed or failed, how many fails and how many warnings there were.
AEC kV compensation	Evaluates the automatic exposure control.
AEC mA compensation	Evaluates the automatic exposure control.
AEC reproducibility	Evaluates the automatic exposure control.
AEC reciprocity	Evaluates the automatic exposure control.
AEC field balance	Evaluates the automatic exposure control.
AEC density correction	Evaluates the automatic exposure control.

3.2.6.1 Accuracy

The Accuracy analysis is used to evaluate the inaccuracy for a parameter. This analysis can calculate the relative and absolute difference between the reference value (set value) and the measured value. The differences are compared to the acceptance limits you have specified. The accuracy analysis can be used with all measured parameters (all measured parameters that have diff % and diff Δ columns). You can read the topic Add analysis to see how you add the analysis to a test.

The analysis can calculate and evaluate:

Relative difference: diff %

Absolute difference: diff Δ

By default, only the relative difference is evaluated. If you want to include absolute difference you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

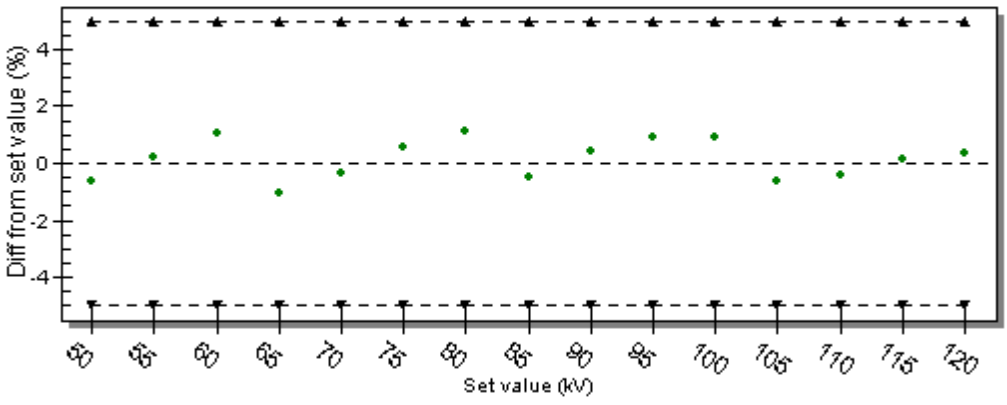
Typical accuracy test

Set mAs (mAs)	SDD (cm)	Set time (ms)
5	70	100

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)
	1	50	49,69	-0,6	0,2070	100,8
	2	55	55,13	0,2	0,2678	112,9
	3	60	60,62	1,0	0,3330	98,27
	4	65	64,33	-1,0	0,3776	98,27
	5	70	69,77	-0,3	0,4390	98,77
	6	75	75,42	0,6	0,5179	99,27
	7	80	80,88	1,1	0,5885	98,77
	8	85	84,61	-0,5	0,6444	99,28
	9	90	90,37	0,4	0,7168	98,77
	10	95	95,83	0,9	0,8055	98,77
	11	100	100,89	0,9	0,8833	98,78
	12	105	104,37	-0,6	0,9383	98,77
	13	110	109,57	-0,4	1,022	98,78
	14	115	115,14	0,1	1,115	98,78
	15	120	120,43	0,4	1,195	98,77

Tube voltage accuracy

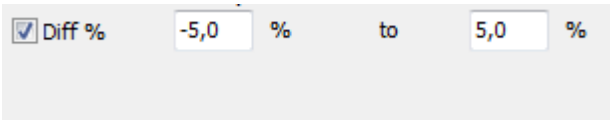
Result: Pass



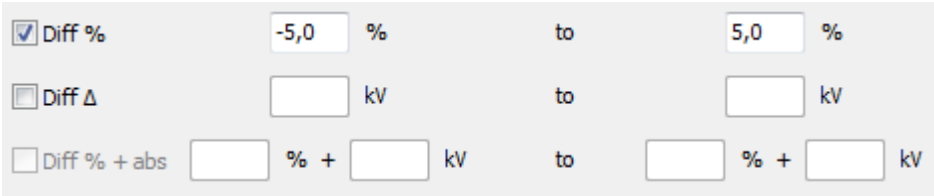
Maximum inaccuracy is 1,1 % at 80,00 kV (Limit: -5,0 % to 5,0 %)

Default pass/fail criteria

When you add the Accuracy analysis the following pass/fail criteria is shown:

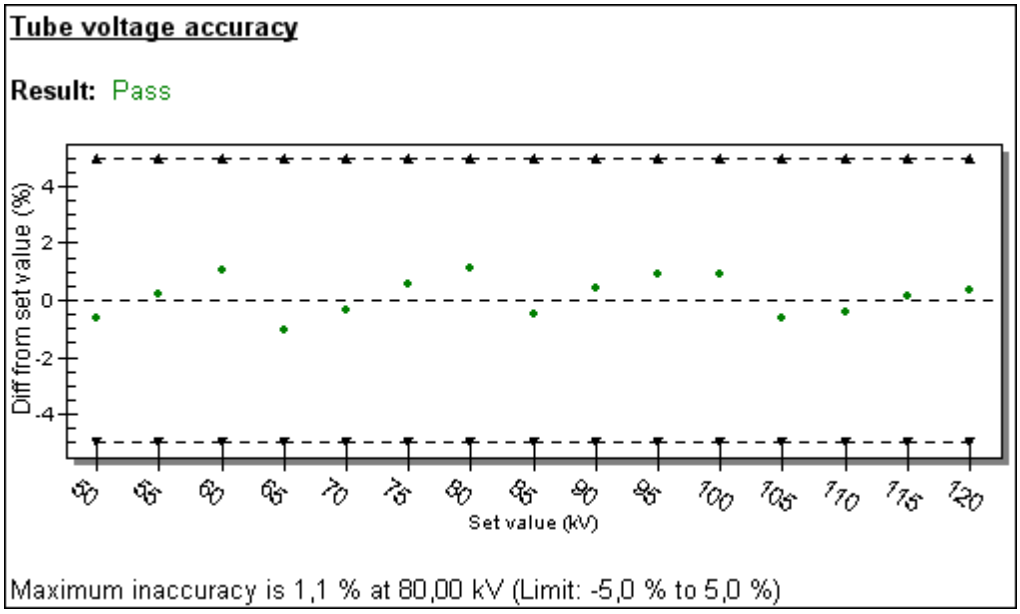


When you modify an Accuracy analysis, all pass/fail criteria is available:



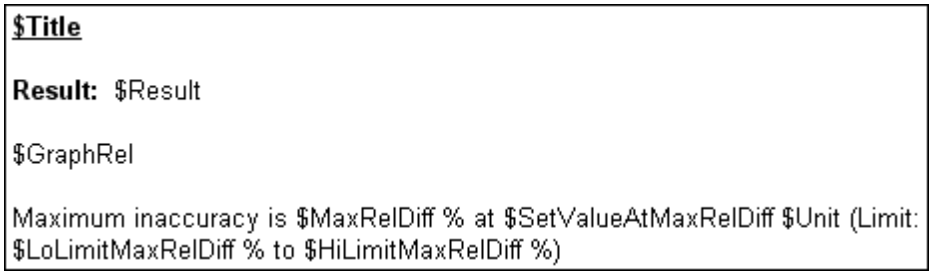
You must modify the layout to see the results of the additional parameters.

Default result



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text Accuracy analysis looks like this:


$Title
Result: $Result
$GraphRel
Maximum inaccuracy is $MaxRelDiff % at $SetValueAtMaxRelDiff $Unit (Limit: $LoLimitMaxRelDiff % to $HiLimitMaxRelDiff %)

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the Accuracy analysis:

$Title (Specified title)
$TestResult (Pass or fail text, the overall result for the test)
$Result (Analysis result)
$GraphRel (Graphical representation of the results as %)
$GraphAbs (Graphical representation of the results)
$MaxRelDiff (Maximum relative difference)
$AbsDiffAtMaxRelDiff (Maximum absolute relative difference)
$SetValueAtMaxRelDiff (The set value for where maximum relative difference occur)
$HiLimitMaxRelDiff (High acceptance limit for the value where maximum difference occur)
$LoLimitMaxRelDiff (Low acceptance limit for the value where maximum difference occur)
$MaxAbsDiff (Maximum absolute difference)
$SetValueAtMaxAbsDiff (The set value for where maximum absolute difference occur)
$HiLimitMaxAbsDiff (High acceptance limit for the value where maximum difference occur)
$LoLimitMaxAbsDiff (Low acceptance limit for the value where maximum difference occur)
$Unit (The current unit)

Calculations

The relative difference is calculated as:

diff % = 100 * (Measured value - Set value) / Set value

The absolute difference is calculated as:

diff Δ = Measured value - Set value

Required columns (or general settings)

The following columns are required for the Accuracy analysis:

Parameter	Description
Set value	This is the reference value the measured values is compared to. The set value can be placed as column or in general settings.
Measured value	The measured value is used to calculate the deviation from the reference value.
diff %	This is the calculated relative difference between the reference value and the measured value. This column is optional, but if relative difference is evaluated, it is recommended to include this column since the indication of failing values is done in this column.
diff Δ	This is the calculated absolute difference between the reference value and the measured value. This column is optional, but if absolute difference is evaluated, it is recommended to include this column since the indication of failing values is done in this column.

3.2.6.2 Reproducibility

The Reproducibility analysis is used to evaluate the reproducibility for a parameter. This analysis can calculate the deviation from mean value, coefficient of variation and standard deviation. You can specify pass/fail criteria for these parameters. The reproducibility analysis can be used with all parameters that have a "diff from mean (%)" column (this is all measured parameters and the user calculation). You can read the topic Add analysis to see how you add the analysis to a test.

By default, deviation from mean value and coefficient of variation are evaluated. If you want to include the standard deviation also, you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

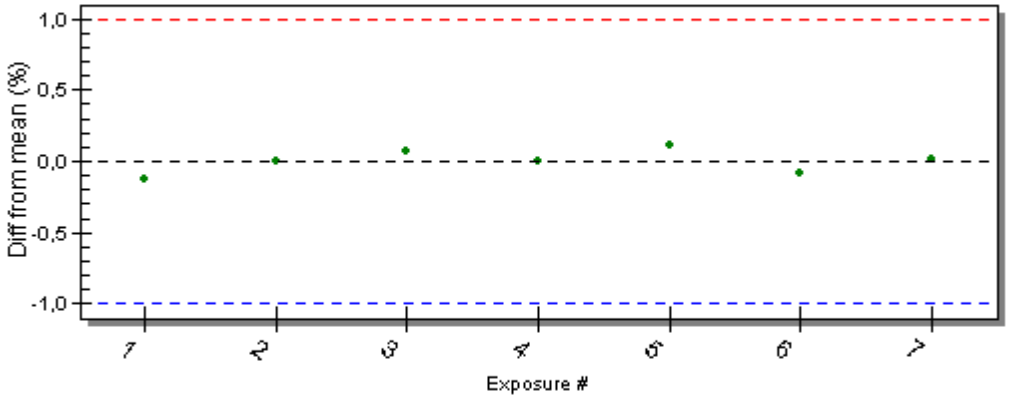
Typical reproducibility test

Set time (ms)	Set mAs (mAs)	SDD (cm)
100	5	70

View / Select	#	Set kV (kV)	Tube voltage (kV) (Piranha)	kVp diff from mean (%)
	1	80	80,59	-0,1
	2	80	80,69	0,0
	3	80	80,74	0,1
	4	80	80,69	0,0
	5	80	80,77	0,1
	6	80	80,62	-0,1
	7	80	80,70	0,0

Tube voltage reproducibility

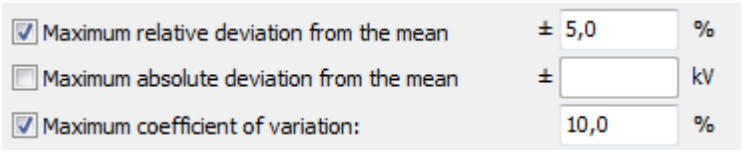
Result: Pass



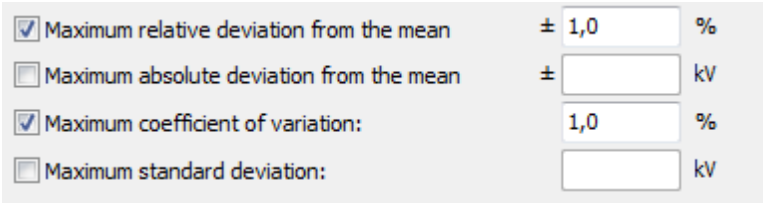
Coefficient of variation is 0,1 % (Limit: 1,0 %)
The mean value is 80,69 kV (Standard deviation: 0,07 kV)
Maximum deviation from the mean value is 0,1 % (Limit 1,0 %)

Default pass/fail criteria

When you add the Reproducibility analysis the following pass/fail criteria is shown:

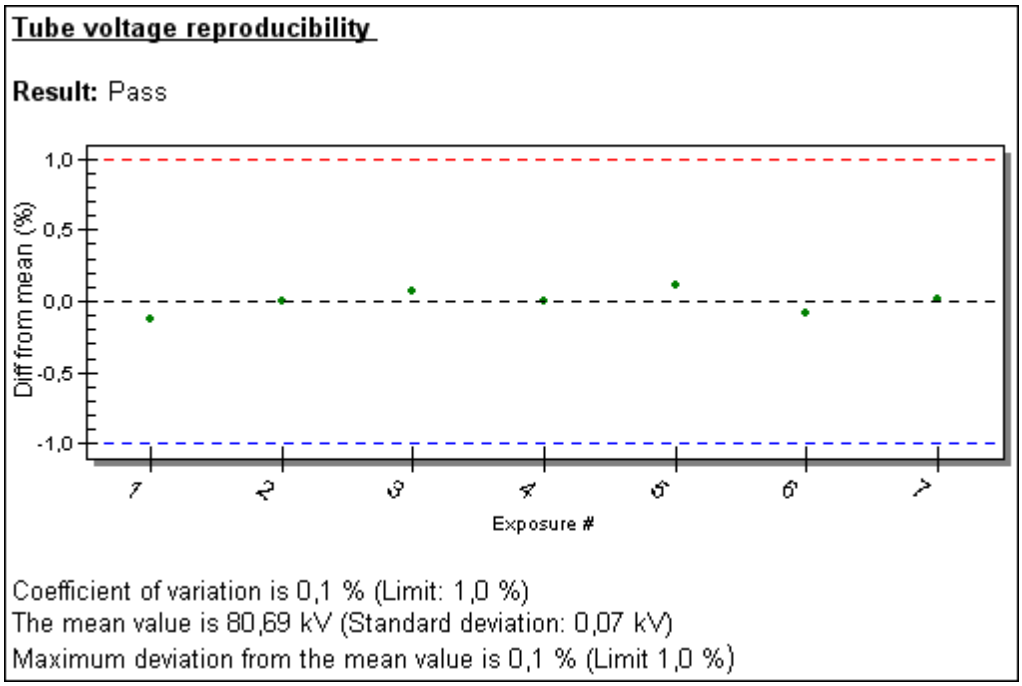


When you modify an Reproducibility analysis, all pass/fail criteria are available:



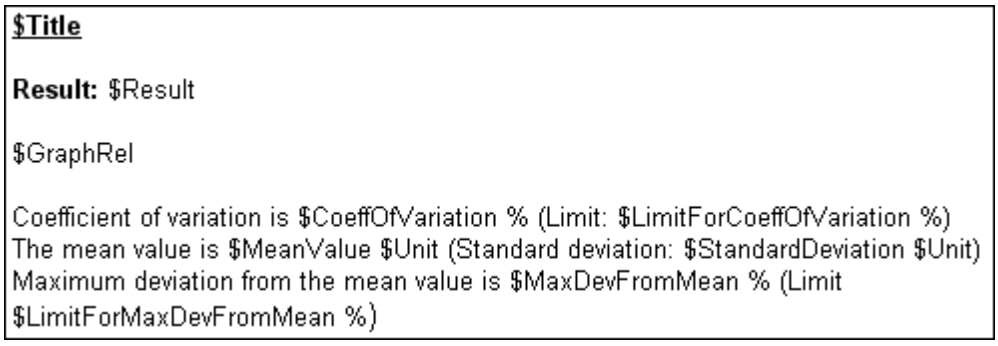
You must modify the layout to see the results of the additional parameters.

Default result



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text Reproducibility analysis looks like this:


$Title
Result: $Result
$GraphRel
Coefficient of variation is $CoeffOfVariation % (Limit: $LimitForCoeffOfVariation %)
The mean value is $MeanValue $Unit (Standard deviation: $StandardDeviation $Unit)
Maximum deviation from the mean value is $MaxDevFromMean % (Limit $LimitForMaxDevFromMean %)

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the Reproducibility analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$Unit (The current unit)
$GraphRel (Graphical representation of the results as %)
$MaxDevFromMean (Maximum deviation from mean value (%))
$SetValueAtMaxDevFromMean (The set value for where maximum deviation from mean value occurred)
$LimitForMaxDevFromMean (Acceptance limit for maximum deviation from mean value)
$MeanValue (Mean value)
$StandardDeviation (Standard deviation)
$LimitForStandardDeviation (Maximum allowed standard deviation)
$CoeffOfVariation (Coefficient of variation)
$LimitForCoeffOfVariation (Maximum allowed coefficient of variation)
$TargetFilter (Calibration for first exposure used in analysis)
$AbsMeanValueDeviationFromSetValue (Mean deviation from Set value)
$RelMeanValueDeviationFromSetValue (Mean deviation from Set value (%))

Calculations

The mean ($MeanValue) is calculated as:

$MeanValue = ($Value_1$ + $Value_2$ + ... + $Value_n$) / n (based on rows included in the reproducibility analysis)

for each row included in the reproducibility is the following (a column is available for this for each parameter)

diff from mean (%) = 100 * (Measured value - Mean value) / Mean value

The macro $MaxDevFromMean is set to the maximum of these values.

Coefficient of variation is calculated as:

$CoeffOfVariation = $StandardDeviation / $MeanValue

where the Standard deviation is calculated as:

$StandardDeviation = v [((X_1 - $MeanValue)^2 + ($X_2$ - $MeanValue)^2 + ... + ($X_n$ - $MeanValue)^2)/n]

Required columns (or general settings)

The following columns are required for the Reproducibility analysis:

Parameter	Description
Measured value	The measured values are used to calculate the difference from mean value, coefficient of variation and standard deviation.
diff from mean (%)	This is the calculated relative difference between the each individual measured value and the mean value of all measured values. This column is optional, however, it is recommended to have this column if this parameter is evaluated since the indication of failing exposures is made in this column.

3.2.6.3 mA linearity

The mA linearity analysis is used to evaluate the linearity of an X-ray system. The analysis can check the exposure/mAs between adjacent stations, difference between highest/lowest and the deviation from average. You can specify pass/fail criteria for these parameters. You can read the topic Add analysis to see how you add the analysis to a test.

By default, only the difference between adjacent stations are evaluated. If you want to include the standard deviation also, you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

Typical mA linearity test

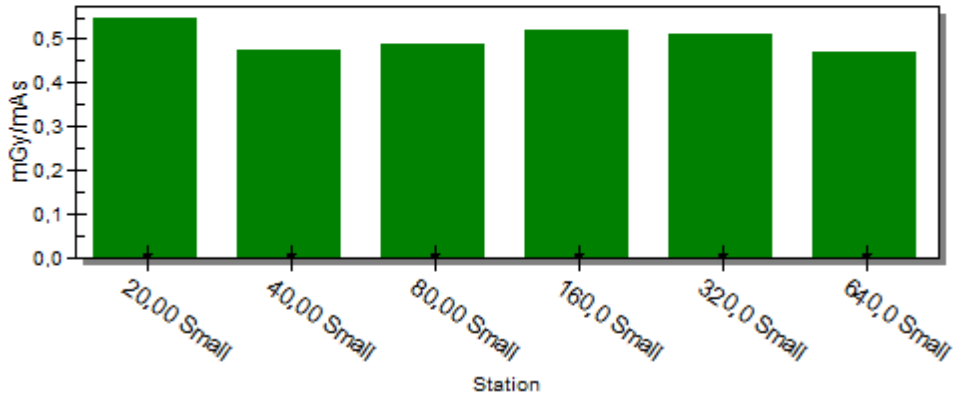
Set kV (kV)	SDD (cm)	SSD (cm)
80,0	50,00	100,0

View / Select	#	Set mAs (mAs)	Exposure (mGy)	Exposure (norm) (mGy)	Focal spot	Exposure/set mAs (mGy/mAs)
	1	20,00	11,00	2,750	Small	0,5500
	2	40,00	19,00	4,750	Small	0,4750
	3	80,00	39,00	9,750	Small	0,4875
	4	160,0	83,00	20,75	Small	0,5188
	5	320,0	164,0	41,00	Small	0,5125
	6	640,0	300,0	75,00	Small	0,4688

mA linearity

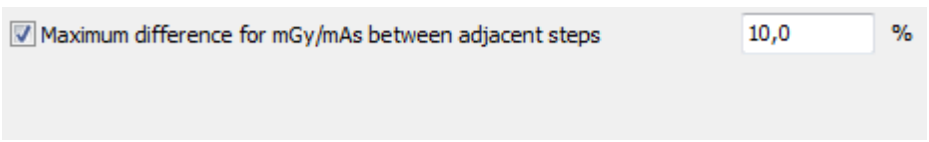
Result:

Maximum difference in mGy/mAs between adjacent stations: 7,3 % (limit 10,0 %)

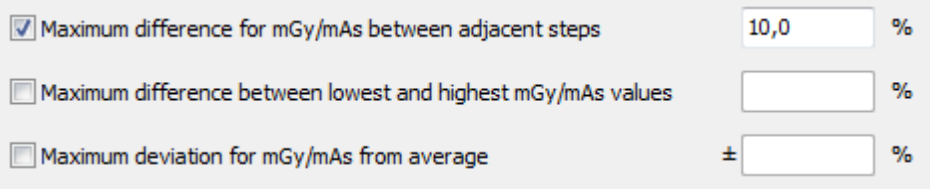


Default pass/fail criteria

When you add the mA linearity analysis the following pass/fail criteria is shown:



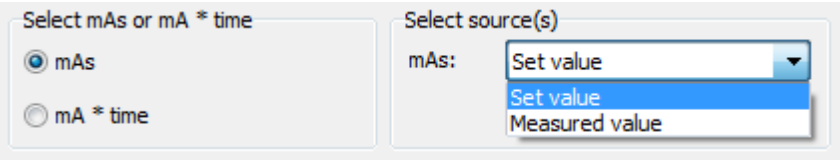
When you modify an mA linearity analysis, all pass/fail criteria is available:



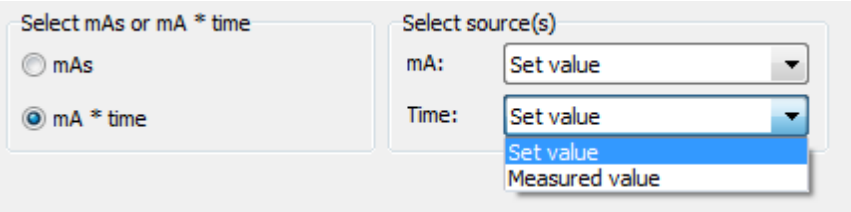
You must modify the layout to see the results of the additional parameters.

Select parameters

You can chose between measured or set values and between mAs or mA - time when you do the linearity evaluation.

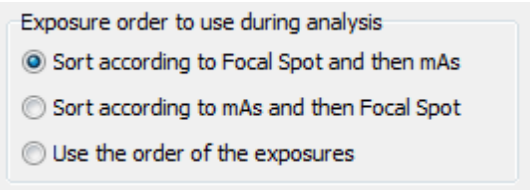


or



Select sort order

You can decide how you want the exposures sorted before the analysis is performed.

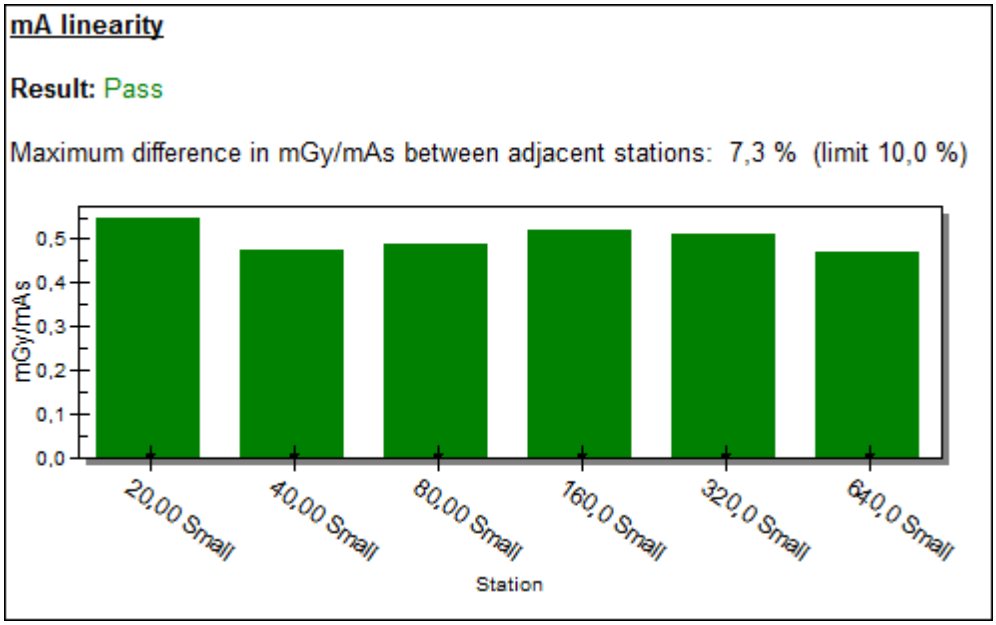

Exposure order to use during analysis
Sort according to Focal Spot and then mAs
Sort according to mAs and then Focal Spot
Use the order of the exposures

Sort according to Focal Spot and then mAs
Exposure are sorted based on the Focal Spot size information you have provided in this column. For each focal spot size used, the exposures are sorted based on mAs. The calculations will be done after the sorting is completed.

Sort according to mAs and then Focal Spot
Exposure are sorted based on mAs. For each mAs station used, the exposures are sorted based on focal spot size. The calculations will be done after the sorting is completed.

Use the order of the exposures
No sorting is performed. The evaluation of linearity is done on the exposures exactly in the same order as they where measured.

Default result



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text mA linearity analysis looks like this:

$Title

Result: $TestResult

Maximum difference in $Unit between adjacent stations: $MaxDiffAdjSteps % (limit $LimitMaxDiffAdjSteps %)

$GraphAbs

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the mA linearity analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$Unit (The current unit)
$GraphRel (Graphical representation of the results as %)
$GraphAbs (Graphical representation of the results)
$SetKV (Set value for kV for the lowest mAs value (or from general settings))
$FocalSpot (Focal spot for lowest mAs value (or from general settings))
$MaxExpPermAs (Maximum value)
$MinExpPermAs (Minimum value)
$AverageExpPermAs (Average value)
$MaxDevFromAverage (Maximum deviation from average (%))
$LimitMaxDevFromAverage (Limit for maximum deviation from average (%))
$DiffHighLow (Difference between the highest and lowest Exp/mAs value (%))
$LimitDiffHighLow (Limit for difference between the highest and lowest Exp/mAs value (%))
$MaxDiffAdjSteps (Maximum difference between adjacent steps (%))
$LimitMaxDiffAdjSteps (Limit for maximum difference between adjacent steps (%))
$LimitMinExpPermAs (Limit for min. value)
$LimitMaxExpPermAs (Limit for max. value)
$TargetFilter (Calibration for first exposure used in analysis)

Calculations

- The exposure/mAs differences between adjacent stations are calculated as:

Diff between adjacent steps = **100 * | ValueA - ValueB | / (ValueA + ValueB)**

The macro $MaxDiffAdjSteps is set to the maximum of these values and compared against the limit you specify for "Maximum difference between adjacent stations"

- The exposure/mAs difference between highest and lowest is calculated as:

diff between high and low = **100 * (Highest - Highest) / (Higest + Lowest)**

The macro $DiffHighLow is set to the maximum of these values and compared against the limit you specify for "Maximum difference between highest and lowest"

- The mean value is calculated as:

$MeanValue = (Exposure/mAs$_1$ + Exposure/mAs$_2$ + ... + Exposure/mAs$_n$) / n

for each row included in the mA linearity is the following calculated:

diff from mean (%) = 100 * (Exppsure/mAs - Mean value) / Mean value

The macro $MaxDevFromAverage is set to the maximum of these values and compared with the limit you set for "Maximum deviation from average"

Required columns (or general settings)

The following columns are required for the mA linearity analysis:

Parameter	Description
Set mAs (Set value) or Tube mAs (Measured)	For a **mAs generator** the set mAs or the measured mAs is required to evaluate the linearity. One of these columns are required for mAs generators.
Set mA (Set value) or Tube mA (Measured)	For a **mA-time generator** the set mA and the is always required. If measured mA is used to evaluate the mA linearity this column is required as well.
Set Time (Set value) or Exposure time (Measured)	For a **mA-time generator** the set Time and the is always required. If measured Time is used to evaluate the mA linearity this column is required as well.
Exposure (Measured) or Exposure (norm)	The measured exposure value is required for the evaluation of linearity. You can use the measured exposure or the normalized (normalized to a certain distance). One of these columns is required for mA-time generators.
Exposure/Set mAs or Exposure/mAs (Measured)	This is the calculated "exposure/mAs" value. This column is optional, however, it is recommended to include this column since the indication of failing values is done in this column.

3.2.6.4 HVL

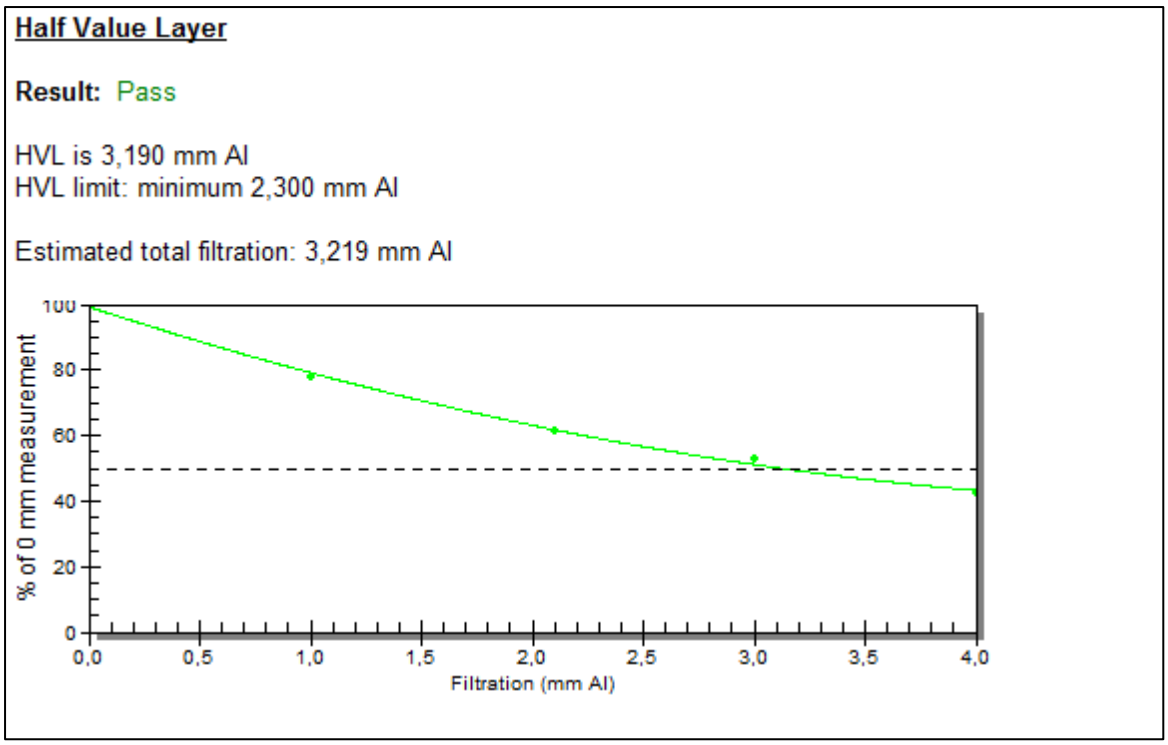
The HVL analysis is used to evaluate the half value layer based on a number of exposures where filtration is added in steps to decrease the exposure (or exposure rate) to 50% or less. The HVL analysis can be used with exposure or exposure rate measurements. You can read the topic Add analysis to see how you add the analysis to a test.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

Typical HVL test

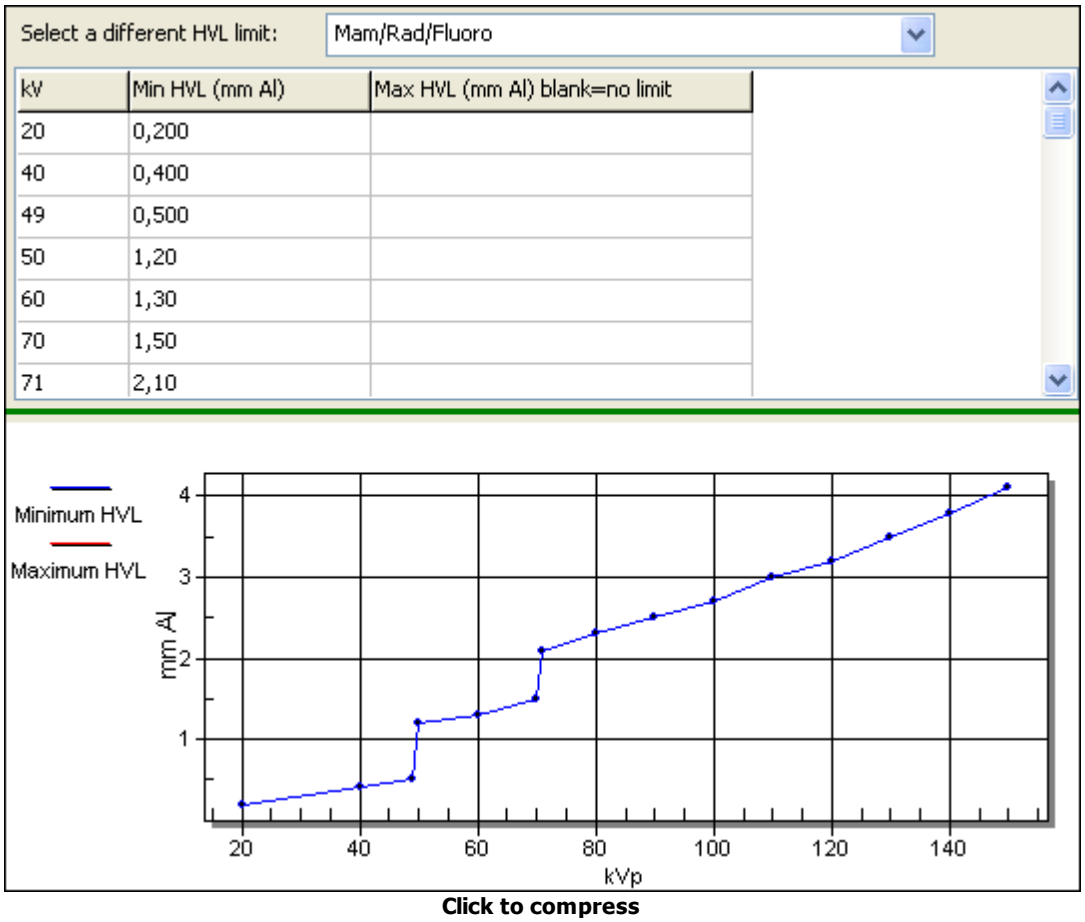
Set mAs (mAs)	Set kV (kV)
2,5	80

View / Select	#	Set Added filtr. (mm Al)	Exposure (mGy)
	1	0,0	0,3006
	2	1,0	0,2341
	3	2,1	0,1847
	4	3,0	0,1588
	5	4,0	0,1276



Default pass/fail criteria

When you add the HVL analysis the following pass/fail criteria is shown:



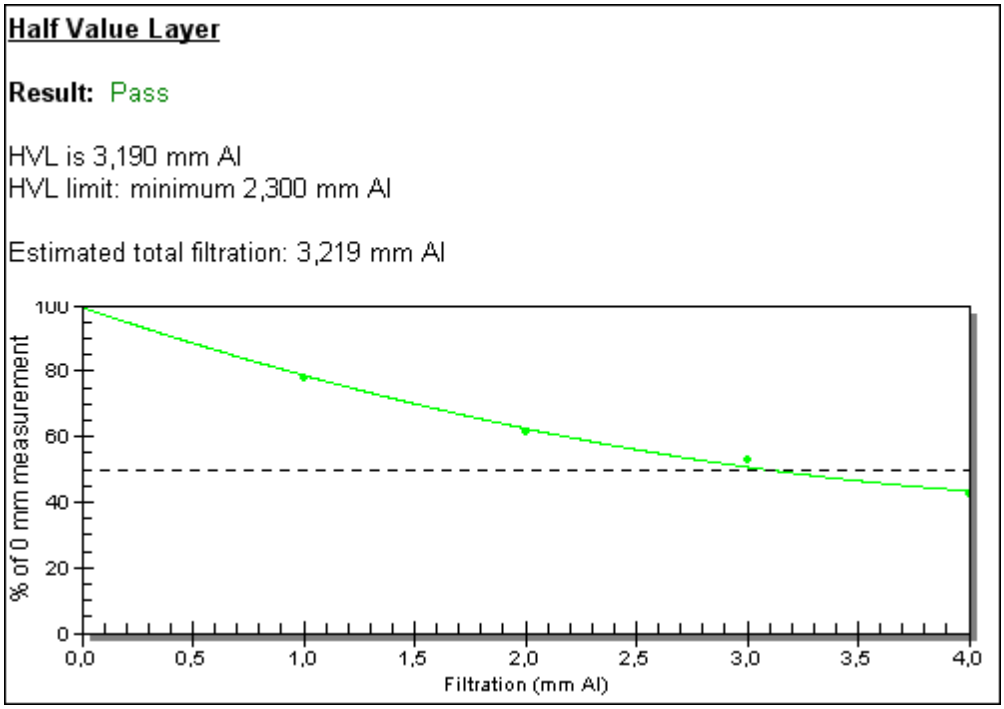
Click to compress

There are a number of pre-defined HVL pass/fail criteria to chose from:

ACR/CAR Mammo Mo/Mo
ACR/CAR Mammo Mo/Rh
ACR/CAR Mammo Rh/Rh
ACR/CAR Mammo W/Rh
FDA (mfg. before June 10 2006)
FDA (mfg. on/after June 10, 2006)
FDA Dental (mfg. after Dec. 1, 1980)
FDA Dental (mfg. on/before Dec. 1, 1980)
Mam/Rad/Fluoro
Mammo Mo/Mo
Mammo Mo/Rh
Mammo Rh/Rh
Mammo W/Rh
None

You can also select "None" and create your own pass/fail criteria.

Default result



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text HVL analysis looks like this:

$Title

Result: $Result

HVL is $CalcHVL mm Al
HVL limit: minimum $MinHVL mm Al

Estimated total filtration: $EstimTF mm Al

$Graph

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the HVL analysis:

$Title (Specified title)
$TestResult (Pass or fail text, the overall result for the test)
$Result (Analysis result)
$CalcHVL (Calculated HVL)
$EstimTF (Estimated TF)
$Graph (Graphical representation of the result)
$LimitGraph (Graphical presentation of the limits)
$MaxHVL (High limit for HVL)
$MinHVL (Low limit for HVL)
$SetkVpForHVL (Set kVp for HVL measurement)
$MeaskVpForHVL (Meas. kVp for HVL measurement)
$Unit (The current unit)

Calculations

- The HVL is calculated with the 2-point method:

$$HVL = \left(T_b \cdot ln\left(\frac{2 \cdot E_a}{E_0}\right) - T_a \cdot ln\left(\frac{2 \cdot E_b}{E_0}\right)\right) \Big/ ln\left(\frac{E_a}{E_b}\right)$$

HVL is set to $CalcHVL

where
ln = natural logarithm
Eo = Direct exposure reading without added filtration = 0 mm
Ea = Exposure reading above 50 %
Eb = Exposure reading below 50 %
Ta = Added filtration used when Ea measurement was made
Tb = Added filtration used when Eb measurement was made

Required columns (or general settings)

The following columns are required for the mA linearity analysis:

Parameter	Description
Added filtr. (Set value)	This column is required to calculate the half value layer.
Exposure (Measured) or Exposure rate (Measured)	The measured exposure value (or exposure rate) is required fro the calculation of half value layer. You can use the measured exposure or the normalized (normalized to a certain distance).
Ratio (Calculated) or Ratio [rate] (Calculated)	This column shows how much the exposure (or exposure rate) has decreased compared to added filtration = 0 mm Al. This column is optional.
Set kV (Set value)	Tube voltage used for the half value layer measurement.

3.2.6.5 QuickHVL

The HVL analysis is used to compare the direct measured HVL with the pass/fail criteria. This analysis is evaluating only **one exposure**. You can read the topic Add analysis to see how you add the analysis to a test.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

Typical QuickHVL test

Set mAs (mAs)	SDD (cm)	Set time (ms)
5	70	100

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)	HVL (mm Al)
	1	50	49,69	-0,6	0,2070	100,8	
	2	55	55,13	0,2	0,2678	112,9	
	3	60	60,62	1,0	0,3330	98,27	
	4	65	64,33	-1,0	0,3776	98,27	
	5	70	69,77	-0,3	0,4390	98,77	
	6	75	75,42	0,6	0,5179	99,27	
	7	80	80,88	1,1	0,5885	98,77	3,23
	8	85	84,61	-0,5	0,6444	99,28	
	9	90	90,37	0,4	0,7168	98,77	
	10	95	95,83	0,9	0,8055	98,77	
	11	100	100,89	0,9	0,8833	98,78	
	12	105	104,37	-0,6	0,9383	98,77	
	13	110	109,57	-0,4	1,022	98,78	
	14	115	115,14	0,1	1,115	98,78	
	15	120	120,43	0,4	1,195	98,77	

(the QuickHVL analysis is only using row #7 in this case)

Half Value Layer

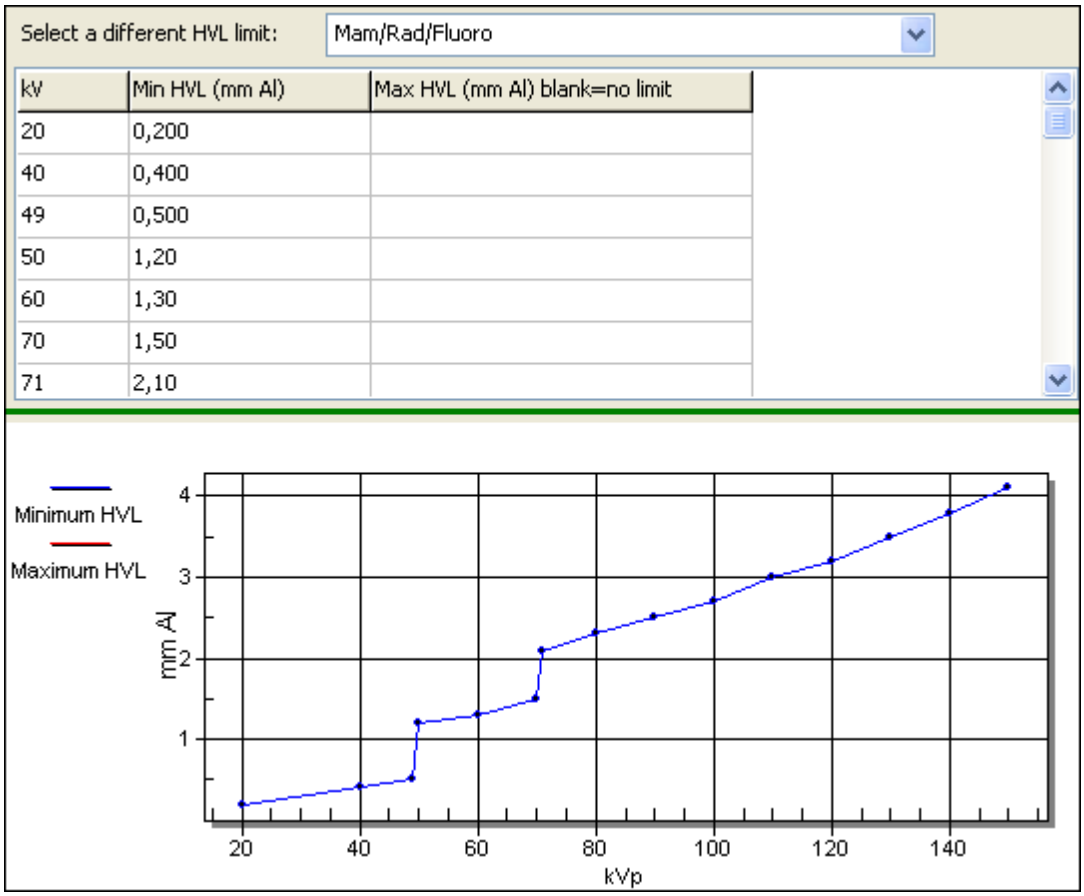
Result:

HVL is 3,23 mm Al at 80 kV
HVL limit: minimum 2,30 mm Al

Total filtration: --- mm Al

Default pass/fail criteria

When you add the QuickHVL analysis the following pass/fail criteria is shown:



Click to compress

There are a number of pre-defined HVL pass/fail criteria to chose from:

ACR/CAR Mammo Mo/Mo
ACR/CAR Mammo Mo/Rh
ACR/CAR Mammo Rh/Rh
ACR/CAR Mammo W/Rh
FDA (mfg. before June 10 2006)
FDA (mfg. on/after June 10, 2006)
FDA Dental (mfg. after Dec. 1, 1980)
FDA Dental (mfg. on/before Dec. 1, 1980)
Mam/Rad/Fluoro
Mammo Mo/Mo
Mammo Mo/Rh
Mammo Rh/Rh
Mammo W/Rh
None

You can also select "None" and create your own pass/fail criteria.

Default result

Half Value Layer

Result: Pass

HVL is 3,10 mm Al
HVL limit: minimum 2,30 mm Al

Total filtration: 3,2 mm Al

Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text QuickHVL analysis looks like this:

$Title

Result: $TestResult

HVL is $MeasHVL mm Al
HVL limit: minimum $MinHVL mm Al

Total filtration: $MeasTF mm Al

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the Reproducibility analysis:

$Title (Specified title)
$TestResult (Pass or fail text, the overall result for the test)
$Result (Analysis result)
$LimitGraph (Graphical presentation of the limits)
$MaxHVL (High limit for HVL)
$MinHVL (Low limit for HVL)
$SetkVpForHVL (Set kVp for HVL measurement)
$MeaskVpForHVL (Meas. kVp for HVL measurement)
$MeasHVL (Measured HVL value)
$MeasTF (Measured total filtration)
$RowNo (Row number that is evaluated)
$Unit (The current unit)

Calculations

- The HVL is measured directly and available from the meter:

$MeasHVL = HVL (Measured)

Required columns (or general settings)

The following columns are required for the mA linearity analysis:

Parameter	Description
HVL (Measured)	This column is required.
Total filtr. (Measured)	This column is optional but required if you want the total filtration value presented.

3.2.6.6 CTDI

The CTDI analysis is used to evaluate the CT dose index on computed tomography systems. It uses 5 exposures (with a dose-length calibrated detector, normally a pencil ion chamber) where a 5-hole phantom is used. You can read the topic Add analysis to see how you add the analysis to a test.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

Typical CTDI test

View / Select	#	Set kV (kV)	CT phantom position	CT exposure (mGycm)	Slice Thickness (cm)	Number of slices	Set mAs (mAs)	Pitch (mm/rot)	CTDI (mGy)
	1	80,0	A (center)	0,1346	1,00	0,5	250,0	0,3	0,2692
	2		B (12 o'clock)	0,1396					0,2792
	3		C (3 o'clock)	0,1392					0,2784
	4		D (6 o'clock)	0,1382					0,2764
	5		E (9 o'clock)	0,1392					0,2784
	6	120,0	A (center)	0,3560	2,00	0,5	200,0	0,5	0,3560
	7		B (12 o'clock)	0,3602					0,3602
	8		C (3 o'clock)	0,3607					0,3607
	9		D (6 o'clock)	0,3600					0,3600
	10		E (9 o'clock)	0,3596					0,3596

Click to compress

CTDI at 80 kV

Result: Pass

Weighted CTDI: CTDI(100 w) is 0,2751 mGy

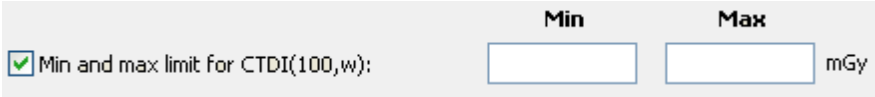
CTDI at 120 kV

Result: Pass

Weighted CTDI: CTDI(100 w) is 0,3588 mGy

Default pass/fail criteria

When you add the CTDI analysis the following pass/fail criteria is shown:



No default limits are specified, you must fill out limit. If you leave a limit blank not test for that criteria is done.

When you modify an CTDI analysis, all pass/fail criteria are available:



You must modify the layout to see the results of the additional parameters.

Default result

CTDI

Result: Pass

Weighted CTDI at 100,0 kV is CTDI(100,w) = 5,734 mGy (Limit: max 7,000 mGy)

Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text CTDI analysis looks like this:

$Title

Result: $TestResult

Weighted CTDI at $SetkVForCTDI kV is CTDI(100,w) = $CTDIw $Unitw (Limit: max $MaxCTDIw $Unitw)

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the CTDI analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$SetkVForCTDI (Set kV at which CTDI was evaluated (if a column, take value for Pos A))
$SetNumOfSlices (Set value for number of slices)
$SetSliceThickness (Set value for slice thickness)
$SetPitch (Set pitch)
$MinCTDIwn (Minimum value)
$MaxCTDIwn (Maximum value)
$MinCTDIw (Minimum value)
$MaxCTDIw (Maximum value)
$CTDIwn (Measured value CTDI normalized)
$Unitwn (Unit for CTDI normalized)
$CTDIw (Measured value CTDI weighted)
$Unitw (Unit for CTDI weighted)
$MinCTDIvol (Minimum value)
$MaxCTDIvol (Maximum value)
$CTDIvol (Measured value CTDI volume)
$Unitvol (Unit for CTDI volume)
$DLP (Measured value for DLP)
$UnitDLP (Unit for DLP)
$MinDLP (Minimum value)
$MaxDLP (Maximum value)
$SetmAs (Set mAs)

Calculations

CTDI for an individual position is calculated as:

CTDI(100,A(or B C D E)) = CT Exposure(Measured) / (Num of Slices × Slice Thickness)

where

The central CTDI is calculated as:

CTDI(100,c) = CTDI(100,A)

The peripheral CTDI is calculated as:

CTDI(100,p) = [CTDI(100,B) + CTDI(100,C) + CTDI(100,D) + CTDI(100,E)] / 4

The weighted CTDI, CTDI(100,w), is calculated as:

$CTDIw = 1/3 * CTDI(100,c) + 2/3 * CTDI(100,p)

The normalized CTDI, CTDI(100,w,n) is calculated as:

$CTDIwn = $CTDIwn / Set mAs

The volume CTDI, CTDI(100,vol), for a helical (spiral) scanning is calculated as:

$CTDIvol = CTDI(100,w) / Pitch

where the Pitch is the table movement per gantry rotation.

The dose-length product, DLP, is calculated as:

$DLP = CTDIvol / Scan length

where the Pitch is the table movement per gantry rotation.

For more information on CTDI read the report "Radiation Exposure in Computed Tomography" from COCIR, European Coordination Committee of the Radiological and Electromedical Industries (e-mail: cocir@zvei.org)

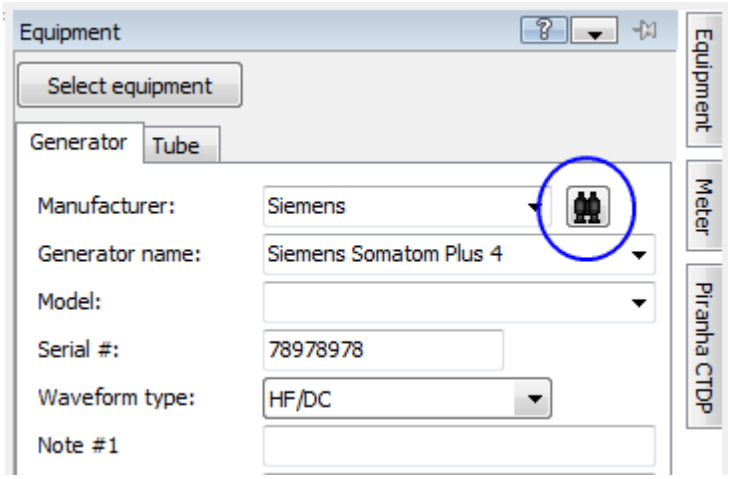
Required columns (or general settings)

The following columns are required for the CTDI analysis:

Parameter	Description
CT Exposure (Measured)	The measured CT dose is used to calculate the CT dose index.
CT phantom position (Set value)	This specifies where the CT chamber is positioned in the phantom. This column is required.
Slice Thickness (Set value)	This column specifies the slice thickness. This column is required.
Number of slices (Set value)	This column specifies the number of slices used. This value is required.
Set mAs (Set value)	This column is required to calculate the normalized CTDI, CTDI(100,n).
Scan length(Set value)	This column is required to calculate DLP.

3.2.6.7 CTDI(helical scan/in phantom)

The CTDI(helical scan/in phantom) analysis is used to evaluate the CT dose index on computed tomography systems using the RTI CT Dose Profiler detector. It uses one exposure in the center hole of a 5-hole phantom and calculates the CTDIw, CTDIvol and DLP. You can read the topic Add analysis to see how you add the analysis to a test. The separate documentation "CT Dose Profiler User' Manual" (comes with the CT Dose Profiler detector) describes the probe and the theory. Since a measurement is only done in the center hole of the phantom, a know relationship between the measured CTDI in the center hole and the peripheral holes is used. This relationship is unique for each CT scanner and is in Ocean defined as the k-factor. A list with the k-factors Ocean uses is available in the Appendix. This analysis picks the correct k-factor depending on the CT scanner name you specify. Use the binocular and pick a scanner from the list. The list will show different CT scanners for the specified manufacturer. Next to each model name, the kV values supported are listed.



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If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

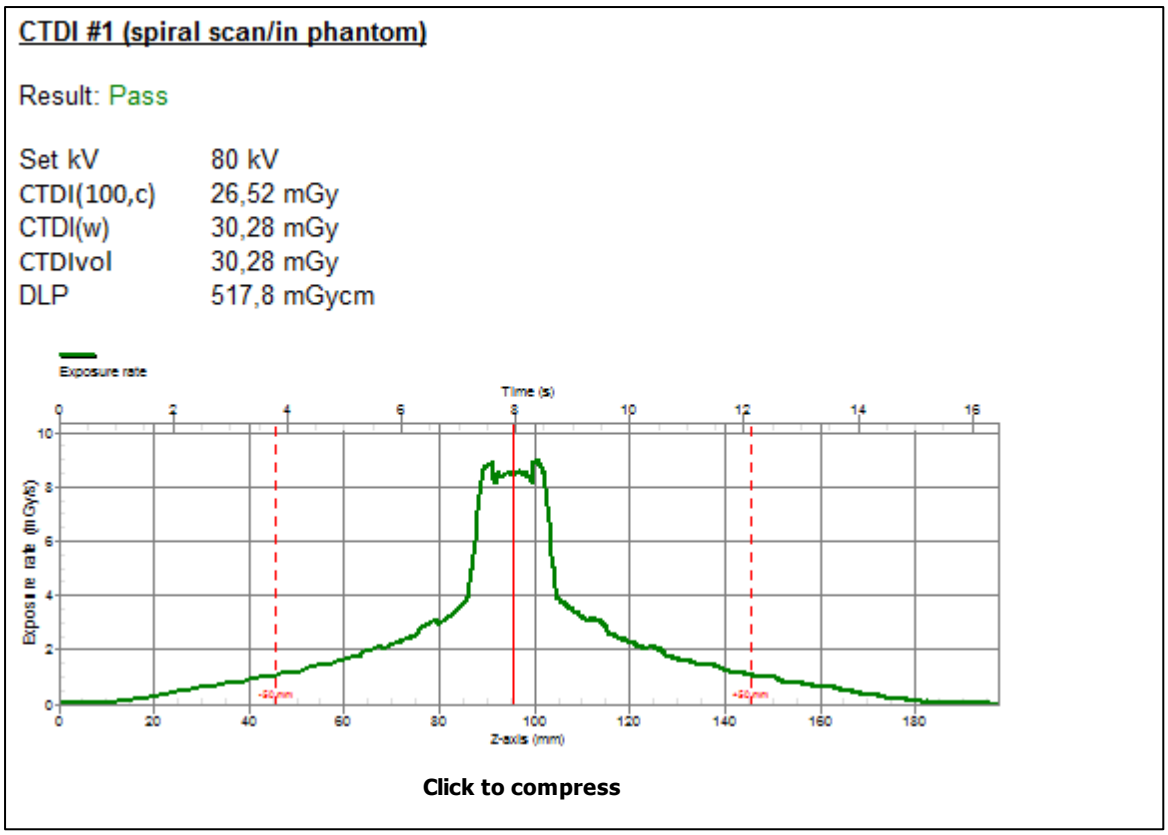
Typical CTDI(helical scan/in phantom) test

This example shows two measurements, each with its own analysis. One is a measurement in a head phantom and the other is in a body phantom.

View / Select	#	Set kV (kV)	CT phantom type	Collimation (mm)	Pitch	Scan length (mm)	Tube rotation time (s)	Scan speed (mm/s)	Measuring time (s)	Exposure (mGy)
	1	80	Head	12	1,000	171	1,00	12,00	16	30,04
	2	120	Head	12	1,000	171	1,00	12,00	16	
	3	100	Body	12	1,000	171	1,00	12,00	16	

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Note that you should use TIMED MODE for this measurement.



Default pass/fail criteria

When you add the CTDI(helical scan/in phantom) analysis the following pass/fail criteria is shown:



No default limits are specified, you must fill out limit. If you leave a limit blank not test for that criteria is done.

When you modify an CTDI(helical scan/in phantom) analysis, all pass/fail criteria are available:



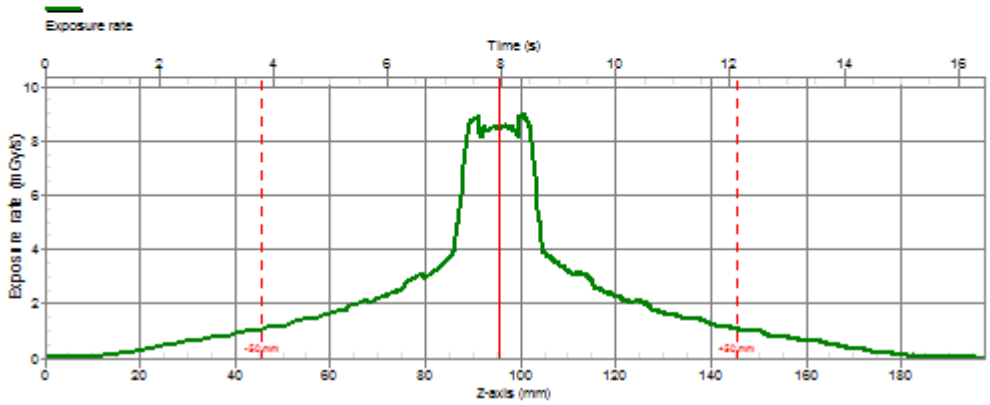
You must modify the layout to see the results of the additional parameters.

Default result

CTDI #1 (spiral scan/in phantom)

Result: Pass

Set kV	80 kV
CTDI(100,c)	26,52 mGy
CTDI(w)	30,28 mGy
CTDIvol	30,28 mGy
DLP	517,8 mGycm



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Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text CTDI(helical scan/in phantom) analysis looks like this:

$Title

Result: $TestResult

Set kV	$SetkV kV
CTDI(100,c)	$CTDIc $Unitw
CTDI(w)	$CTDIw $Unitw
CTDIvol	$CTDIvol $Unitvol
DLP	$DLP $UnitDLP

$DoseProfileGraph

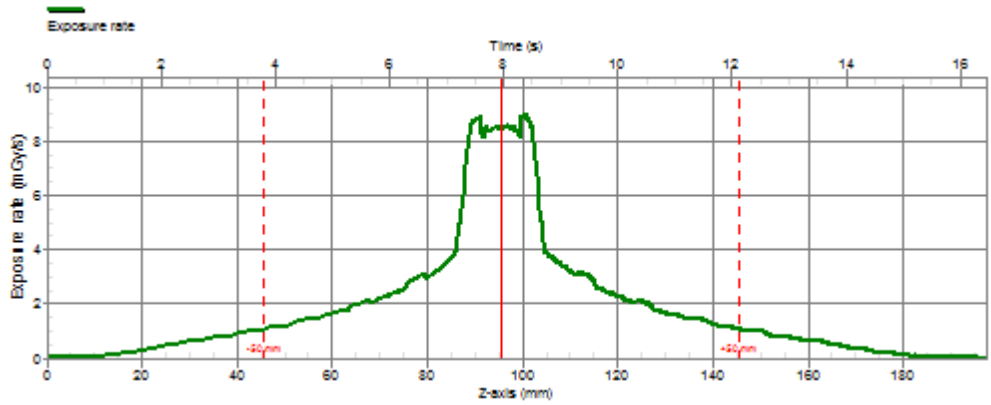
This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the CTDI(helical scan/in phantom) analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$SetkV (Set kVp)
$SetmAs (Set mAs)
$SetPitch (Set pitch)
$SetScanTime (Set value for the scan time)
$SetTubeRotTime (Set tube rotation time)
$SetCollimationNT (Set value for the collimation)
$SetPhantomType (Set value for phantom type)
$ScanSpeed (Calculated scan speed = Set Pitch * Collimation(NT) / Set Tube Rot Time)
$DoseProfileGraph (The CT dose profile graph)
$CTDIc (Measured CTDI(100,c) (center position) from waveform)
$CTDIwn (Measured value CTDI normalized)
$Unitwn (Unit for CTDI normalized)
$MinCTDIwn (Minimum value)
$MaxCTDIwn (Maximum value)
$CTDIw (Measured value CTDI weighted)
$Unitw (Unit for CTDI weighted)
$MinCTDIw (Minimum value)
$MaxCTDIw (Maximum value)
$CTDIvol (Measured value CTDI volume)
$Unitvol (Unit for CTDI volume)
$MinCTDIvol (Minimum value)
$MaxCTDIvol (Maximum value)
$DLP (Measured value for Dose Length Product)
$UnitDLP (Unit for Dose Length Product)
$MinDLP (Minimum value)
$MaxDLP (Maximum value)
$kFactor (Used k-factor (if blank, automatically selected by the analysis))

Calculations

The CTDI(100,c) is calculated in the following way:

All calculations are done from the dose profile waveform.



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The waveform is an array of samples where the Z-axis (see graph above) represents the position of the sensor and the y-axis represents the exposure rate. The waveform includes a maximum of 1024 samples.

Ocean finds key locations in the waveform in the following way:

1. Find the maximum dose rate that occurred during the scan.
2. Search backward from this point to find where the dose profile goes below 50% of the maximum value and call this position X1 (not shown on graph).
3. Search forward from the point found in step 1 to find where the dose profile goes below 50% of the maximum value and call this position X2 (not shown on graph).
4. Calculate the position halfway between X1 and X2. Call this point X3 (shown as a solid red line in graph above).
5. Calculate "X3-50 mm" and "X3+50 mm" and call these positions X4 and X5, respectively. They are marked with red dotted lines in the graph above and labeled with the text "-50 mm" and "+50 mm", respectively.

The central CTDI, CTDI(100,c) is calculated as:

$CTDIc = "Integrated dose between X4 and X5" * Pitch

Pitch must be specified in the grid.

The weighted CTDI, CTDI(100,w), is calculated as:

$CTDIw = $CTDIc * $kFactor

The k-factor is from the table in the Appendix. The k-factor is found based on kVp, phantom type and CT scanner name. If you want to specify your own k-factor add the "k-factor" column.

The volume CTDI, CTDI(100,vol) for a helical scan is calculated as:

$CTDIvol = $CTDIw / Pitch

The dose-length product, DLP, is calculated as:

$DLP = $CTDIvol * Scan length

Recommended columns (or general settings)

The following columns are recommended for the CTDI(helical scan/in phantom) analysis.

Parameter	Description
Exposure(Measured)	The measured dose from the CT Dose Profiler detector.
Set kV	The set value for kV
CT Phantom type (Set value)	The phantom type, specifies head or body for this analysis
CT phantom position (Set value)	This specifies where the CT chamber is positioned in the phantom. (*not required, center hole is assumed if not specified*)
Collimation (Set value)	This column specifies the collimation.
Pitch (Set value)	This column specifies the pitch.
Scan length (Set value)	This specifies the length of the scan.
Scan speed (Set value)	This specifies the scan speed.
Measuring time	This is the measuring time for TIMED MODE. This is a meter setting (a value used by the meter).
Tube rotation time (Set value)	This is the tube rotation time.

3.2.6.8 Geometric Efficiency(helical scan/free-in-air)

The CTDI(helical scan/free-in-air) analysis is used to evaluate the geometric efficiency on computed tomography systems using the RTI CT Dose Profiler detector. It uses one exposure and calculates calculates the geometric efficiency and CTDI free in air. You can read the topic Add analysis to see how you add the analysis to a test. The separate documentation "CT Dose Profiler User's Manual" (comes with the CT Dose Profiler detector) describes the probe and the theory.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

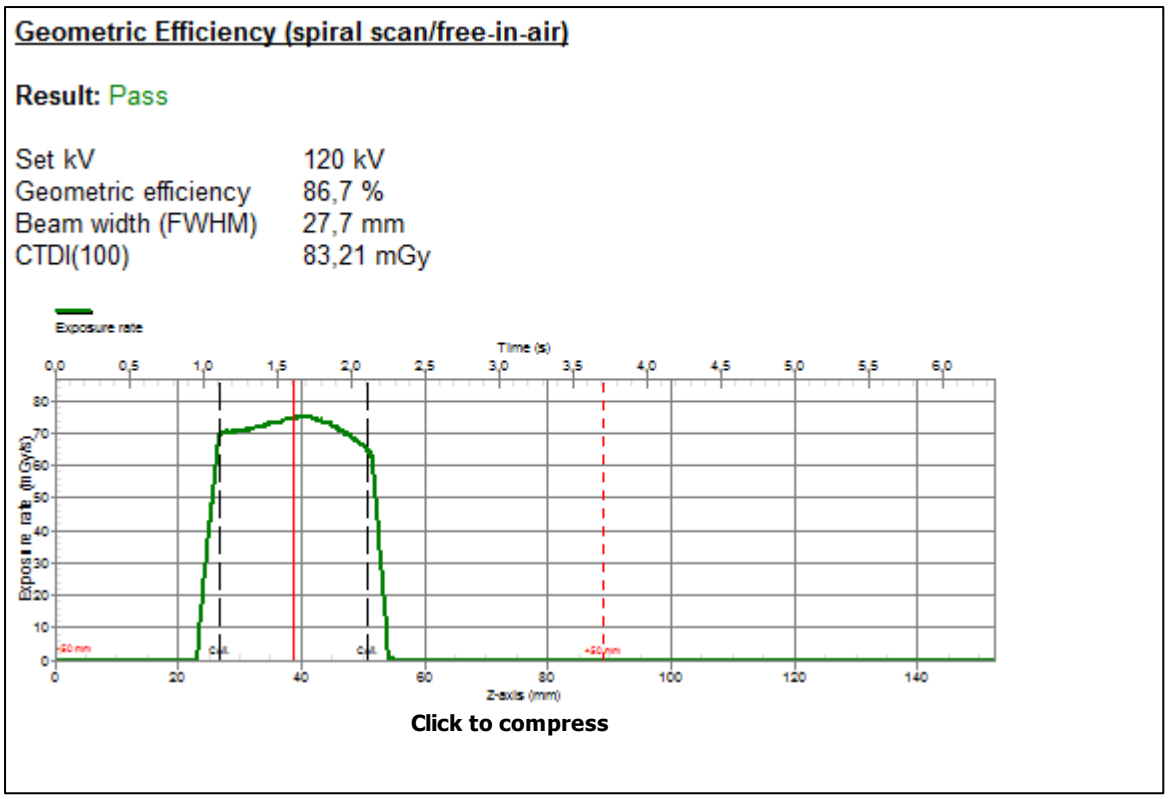
Typical CTD free-in-air and geometric efficiency(helical scan/free-in-air) test

This example shows two measurements, each with its own analysis. One is a measurement in a head phantom and the other is in a body phantom.

View / Select	#	Set kV (kV)	Collimation (mm)	Pitch	Tube rotation time (s)	Scan speed (mm/s)	Measuring time (s)	Exposure (mGy)
	1	120	24	1,000	1,00	24,00	5	87,89
	2	120	12	1,000	1,00	12,00	15	
	3	120	12	1,000	1,00	12,00	5	

Click to compress

Note that you should use TIMED MODE for this measurement.



Default pass/fail criteria

When you add the CTDI(helical scan/in phantom) analysis the following pass/fail criteria is shown:

	Min	Max	
Geometric efficiency:			%
Beam width (FWHM):			mm

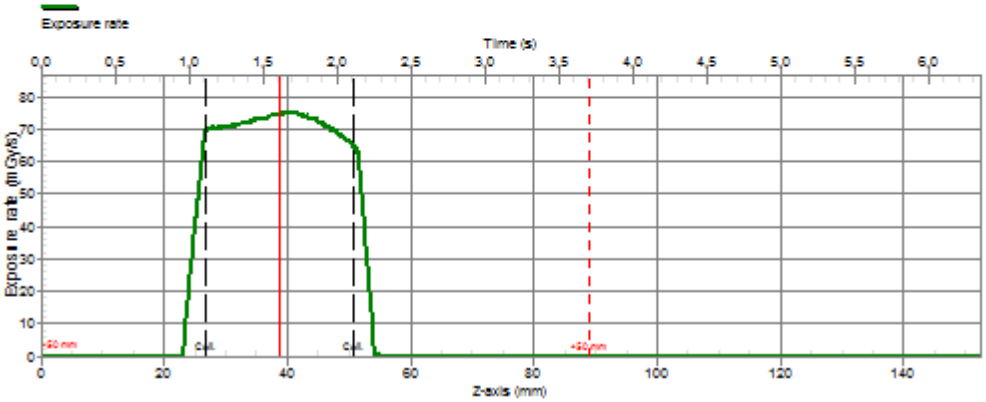
No default limits are specified, you must fill out limit. If you leave a limit blank not test for that criteria is done.

Default result

Geometric Efficiency (spiral scan/free-in-air)

Result: Pass

Set kV	120 kV
Geometric efficiency	86,7 %
Beam width (FWHM)	27,7 mm
CTDI(100)	83,21 mGy



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Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text CTDI(helical scan/free-in-air) analysis looks like this:

$Title

Result: $TestResult

Set kV	$SetkV kV
Geometric efficiency	$GeometricEfficiency %
Beam width (FWHM)	$BeamWidthFWHM mm
CTDI(100)	$CTDI100 $UnitCTDI100

$DoseProfileGraph

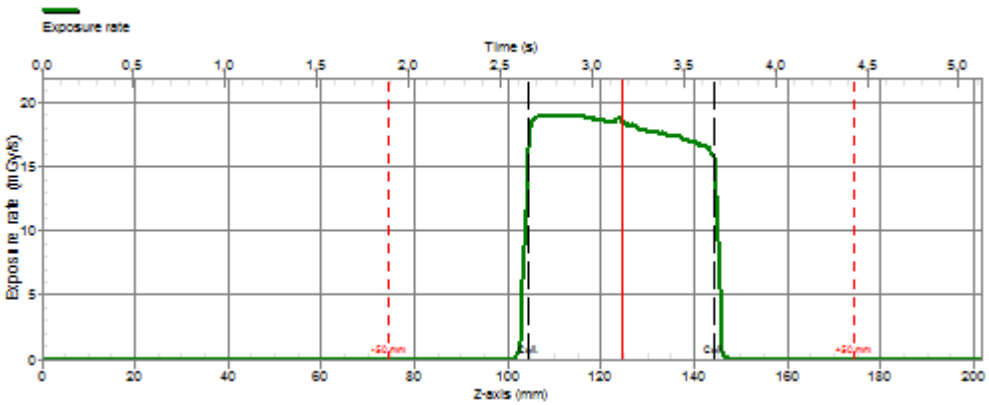
This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the CTDI(helical scan/free-in-air) analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$SetkV (Set kVp)
$SetmAs (Set mAs)
$SetPitch (Set pitch)
$SetScanTime (Set value for the scan time)
$SetTubeRotTime (Set tube rotation time)
$SetCollimationNT (Set value for the collimation)
$SetPhantomType (Set value for phantom type)
$ScanSpeed (Calculated scan speed = Set Pitch * Collimation(NT) / Set Tube Rot Time)
$DoseProfileGraph (The CT dose profile graph)
$CTDI100 (Measured CTDI100)
$UnitCTDI100 (Unit for CTDI)
$BeamWidthFWHM (Beam width from waveform)
$MinBeamWidthFWHM (Minimum value)
$MaxBeamWidthFWHM (Maximum value)
$GeometricEfficiency (Geometric efficiency (from waveform))
$MinGeometricEfficiency (Minimum value)
$MaxGeometricEfficiency (Maximum value)

Calculations

The CTDI(100,c) is calculated in the following way:

All calculations are done from the dose profile waveform.



Click to compress

The waveform is an array of samples where the Z-axis (see graph above) represents the position of the sensor and the y-axis represents the exposure rate. The waveform includes a maximum of 1024 samples.

Ocean finds key locations in the waveform in the following way:

1. Find the maximum dose rate that occurred during the scan.
2. Search backward from this point to find where the dose profile goes below 50% of the maximum value and call this position X1 (not shown on graph).
3. Search forward from the point found in step 1 to find where the dose profile goes below 50% of the maximum value and call this position X2 (not shown on graph).
4. Calculate the position halfway between X1 and X2. Call this point X3 (shown as a solid red line in graph above).
5. Calculate "X3-50 mm" and "X3+50 mm" and call these positions X4 and X5, respectively. They are marked with red dotted lines in the graph above and labeled with the text "-50 mm" and "+50 mm", respectively.

Next find index for the collimation, X6 and X7. The collimation must be specified in the grid. Indicate X6 and X7 with black dotted lines labeled with "Col".

The CTDI free in air is calculated as:

$CTDI100 = "Integrated dose between X4 and X5" * Pitch

Pitch must be specified in the grid.

FWHM is calculated as the distance between X1 and X2:

$BeamWidthFWHM = X2 - X1

Calculate Geometric efficiency in the z-direction (according to IEC 60601-2-44) as:

$GeometricEfficiency = 100* (Dose between X6 and X7) / (Total dose)

Note!

The dose profile waveform is adjusted with the following function (X = FWHM) for 3 mm < X < 40 mm:

$CorrF = 1.25466313 - 0.43935032 * X + 0.34546921 * X^2 - 0.14128364 * X^3 + 0.03057638 * X^4 - 0.00330919 * X^5 + 0.00014071 * X^6$

For X < 3 mm, no valid correction available
For X > 40 mm, CorrF = 1.00

This means that the total dose indicated "between cursors" will differ from the dose value shown in the grid (in the Exposure column) when the FWHM is less than 40 mm.

Recommended columns (or general settings)

The following columns are recommended for the CTDI(helical scan/free-in-air) analysis.

Parameter	Description
Exposure(Measured)	The measured dose from the CT Dose Profiler detector.
Set kV	The set value for kV
CT Phantom type (Set value)	The phantom type, specifies head or body for this analysis (*not required*)
Collimation (Set value)	This column specifies the collimation.
Pitch (Set value)	This column specifies the pitch.
Scan length (Set value)	This specifies the length of the scan. (*not required*)
Scan speed (Set value)	This specifies the scan speed.
Measuring time	This is the measuring time for TIMED MODE. THis is a meter setting (a value used by the meter).
Tube rotation time (Set value)	This is the tube rotation time.

3.2.6.9 AGD(ACR)

The AGD(ACR) analysis is used to evaluate the average glandular dose according to the ACR protocol, ***ACR, Mammography Quality Control Manual, 1999, ISBN 1-55903-142-5***. Supported target/filter combinations are: Mo/30 µm Mo, Mo/25 µm Rh, Rh/25 µm Rh and W/0.5 mm Al. (This analysis is only using one row in your test).

You can read the topic Add analysis to see how you add the analysis to a test.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

Typical AGD(ACR) test using traditional HVL measurement

This example shows how the template looks like when HVL is evaluated with a traditional HVL measurement (by adding filters until the measured dose is reduced to half).

Set kV (kV)	Compr. paddle
26	Yes

View / Select	#	Calibration	HVL(AGD) (mm Al)	Exposure (norm) (mGy)	Set Added filtr. (mm Al)	AGD (mGy)
	1	Mo/30 µm Mo		3,240	0,00	
	2	Mo/30 µm Mo		2,820	0,10	
	3	Mo/30 µm Mo		2,290	0,20	
	4	Mo/30 µm Mo		1,640	0,30	
	5	Mo/30 µm Mo		1,340	0,40	
	6	Mo/30 µm Mo			0,50	
	7	Mo/30 µm Mo	0,323	5,300		0,9948

Half Value Layer

HVL is 0,323 mm Al

AGD (ACR)

Result: Pass

AGD for Mo/30 µm Mo at 26,0 kV is 0,9948 mGy (Max allowed is 3,000 mGy)

Half value layer: 0,323 mm Al
Entrance surface air kerma (ESAK): 5,300 mGy

Typical AGD(ACR) test using Quick HVL

This example shows how the template looks like when HVL is evaluated by using the Quick HVL (Quick HVL is the HVL value measured one exposure, the "1-shot HVL"). All measured data are acquired with one exposure.

Set kV (kV)	Compr. paddle
26	Yes

View / Select	#	Calibration	Exposure (norm) (mGy)	HVL (mm Al)	HVL(AGD) (mm Al)	AGD (mGy)
	1	Mo/30 µm Mo	4,940	0,323	0,323	0,9272

Half Value Layer

HVL is 0,323 mm Al

AGD (ACR)

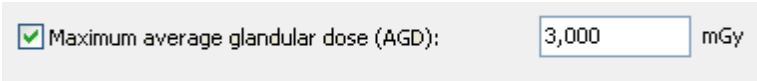
Result: Pass

AGD for Mo/30 µm Mo at 26,0 kV is 0,9948 mGy (Max allowed is 3,000 mGy)

Half value layer: 0,323 mm Al
Entrance surface air kerma (ESAK): 5,300 mGy

Default pass/fail criteria

When you add the AGD(ACR) analysis the following pass/fail criteria is shown:



Default result

AGD (ACR)

Result: Pass

AGD for Mo/30 µm Mo at 27,0 kV is 0,4721 mGy (Max allowed is 3,000 mGy)

Half value layer: 0,323 mm Al
Entrance surface air kerma (ESAK): 2,500 mGy

Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AGD(ACR) analysis looks like this:

$Title

Result: $TestResult

AGD for $TargetFilter at $kVp kV is $AGD $AGDUnit (Max allowed is $LimitMaxAGD $AGDUnit)

Half value layer: $HVL mm Al
Entrance surface air kerma (ESAK): $ESAK $ESAKUnit

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AGD(ACR) analysis:

$Title (Specified title)
$TestResult (Pass or fail text, the overall result for the test)
$Result (Analysis result)
$AGDUnit (AGD unit)
$AGD (Average glandular dose)
$LimitMaxAGD (Max allowed AGD)
$RowNo (Row number used for the analysis)
$kVp (Set kVp)
$HVL (Used HVL)
$TargetFilter (Calibration)
$SSD (Distance to which the AGD is normalized)
$ESAKUnit (ESAK unit)
$ESAK (Measured exposure)
$gFactor (Used g factor)

Calculations

The AGD(ACR), $AGD, is calculated as:

$AGD = $ESAK * $gFactor

where

$ESAK = normalized entrance air kerma, measured exposure value (from the column "Exposure (norm) (Measured)")

$gFactor is the g-factor from the following tables:

Table 1. GLANDULAR DOSE (IN mrad) FOR 1 ROENTGEN ENTRANCE EXPOSURE TO A 4.2-CM BREAST THICKNESS—50% ADIPOSE-50% GLANDULAR BREAST TISSUE—USING A Mo/Mo TARGET-FILTER COMBINATION*

	X-Ray Tube Voltage (kVp)										W/Al Target -Filter Combination
HVL	23	24	25	26	27	28	29	30	31	32	33	
0.23	116											
0.24	121	124										
0.25	126	129	131									
0.26	130	133	135	138								
0.27	135	138	140	142	143							
0.28	140	142	144	146	147	149						
0.29	144	146	148	150	151	153	154					
0.30	149	151	153	155	156	157	158	159				170
0.31	154	156	157	159	160	161	162	163	164			175
0.32	158	160	162	163	164	166	167	168	168	170	171	180
0.33	163	165	166	168	169	170	171	173	173	174	175	185
0.34	168	170	171	172	173	174	175	176	177	178	179	190
0.35		174	175	176	177	178	179	180	181	182	183	194
0.36			179	181	182	183	184	185	185	186	187	199
0.37				185	186	187	188	189	190	191	191	204
0.38					190	191	192	193	194	195	195	208
0.39						196	197	198	198	199	200	213
0.40							201	202	203	204	204	217
0.41								206	207	208	208	221
0.42									211	212	212	225
0.43										215	216	230
0.44											220	234
0.45												238

To convert from entrance exposure in air in roentgens to mean glandular breast dose in millirads, multiply the entrance exposure by the factor shown in the table for the appropriate kVp and beam quality (HVL) combination. For example, a measured entrance exposure of 0.50 roentgens from a Mo/Mo target/filter system at 30 kVp with a measured HVL of 0.36 mm aluminum yields an average glandular dose of (0.50 R) × (185 mrad/R) = 93 mrad or 0.93 mGy.

* Adapted from: Wu X. Breast dosimetry in screen-film mammography. In: Barnes GT, Frey GD (eds), *Screen Film Mammography: Imaging Considerations and Medical PhysicsResponsibilities*. Madison, Wis: Medical Physics Publishing; 1991;159-175. W/Al conversion factors are derived from fits to data from Stanton L., et al. Dosage evaluation in mammography. *Radiology*. 1984;150:577-584.

Table 2. GLANDULAR DOSE (IN mrad) FOR 1 ROENTGEN ENTRANCE EXPOSURE TO A 4.2-CM BREAST THICKNESS—50% ADIPOSE-50% GLANDULAR BREAST TISSUE—USING A Mo/Rh TARGET-FILTER COMBINATION*

	X-Ray Tube Voltage (kVp)										
HVL	25	26	27	28	29	30	31	32	33	34	35
0.28	149	151	154								
0.29	154	156	158	159							
0.30	158	160	162	162	162	163					
0.31	163	164	166	166	166	167	167				
0.32	167	169	171	171	171	171	172	172			
0.33	171	173	175	176	176	176	176	177			
0.34	176	178	179	179	180	180	180	181	181		
0.35	180	181	183	183	184	185	185	186	187		
0.36	185	186	187	187	188	188	189	190	191	191	
0.37	189	190	191	191	192	193	193	194	195	195	
0.38	193	194	196	196	197	197	197	198	199	199	200
0.39	198	199	200	200	201	201	202	202	203	203	204
0.40	202	203	204	204	205	205	206	207	208	208	208
0.41	206	207	208	208	209	209	210	211	212	212	212
0.42	211	211	212	212	213	213	214	215	216	216	217
0.43	215	216	217	217	218	218	219	219	220	220	221
0.44	220	220	221	221	222	222	223	223	224	224	225
0.45	224	224	225	225	226	226	227	227	228	228	229
0.46		228	229	229	230	231	231	232	233	233	234
0.47			233	233	234	235	235	236	237	237	238
0.48			238	238	239	240	240	241	241	242	242
0.49				242	243	243	244	244	245	245	246
0.50					247	247	248	248	249	250	251
0.51						251	252	253	254	254	255
0.52							257	257	258	258	259
0.53							261	261	262	263	264
0.54								265	266	267	268
0.55								269	270	271	272
0.56									275	276	276
0.57									279	280	281
0.58										284	285
0.59										288	289
0.60											293

* Adapted from: Wu X, Gingold EL, Barnes GT, Tucker DM. Normalized average glandular dose in Mo/Rh and Rh/Rh target-filter mammography. *Radiology.* 1994;193:83-89.

Table 3. GLANDULAR DOSE (IN mrad) FOR 1 ROENTGEN ENTRANCE EXPOSURE TO A 4.2-CM BREAST THICKNESS—50% ADIPOSE-50% GLANDULAR BREAST TISSUE—USING AN Rh/Rh TARGET-FILTER COMBINATION*

	X-Ray Tube Voltage (kVp)										
HVL	25	26	27	28	29	30	31	32	33	34	35
0.28	150	155	159								
0.29	155	160	164	168							
0.30	160	164	168	172	176						
0.31	165	168	172	174	180	182					
0.32	169	173	177	181	184	186	188				
0.33	174	178	181	185	188	190	192				
0.34	179	183	186	190	193	195	196	199			
0.35	184	187	190	194	197	199	201	203			
0.36	189	192	195	198	201	204	205	207	209		
0.37	193	196	199	202	205	207	209	211	213		
0.38	198	201	204	207	209	211	213	215	217	219	221
0.39	203	206	208	211	214	216	217	219	221	223	224
0.40	208	211	213	216	218	220	221	223	224	226	228
0.41	213	215	217	220	222	224	225	227	228	230	232
0.42	218	220	222	224	226	228	229	231	232	234	236
0.43	222	224	226	228	230	232	233	235	236	238	240
0.44	227	229	231	233	235	237	238	239	240	242	243
0.45	232	234	235	237	239	241	242	243	244	246	247
0.46			239	241	243	245	246	247	248	250	251
0.47					247	249	250	251	252	254	255
0.48					251	253	254	255	256	258	259
0.49						257	258	259	260	261	262
0.50						261	262	263	264	265	266
0.51							266	267	268	269	270
0.52							270	271	272	273	274
0.53							275	276	276	277	278
0.54								279	280	280	281
0.55								283	284	284	285
0.56									288	288	289
0.57										292	293
0.58										296	297
0.59											300
0.60											304

* Adapted from: Wu X, Gingold EL, Barnes GT, Tucker DM. Normalized average glandular dose in Mo/Rh and Rh/Rh target-filter mammography. *Radiology.* 1994;193:83–89.

Required columns (or general settings)

The following columns are required for the AGD(ACR) analysis:

Parameter	Description
Exposure (norm) (Measured)	The AGD(ACR) analysis is always using the normalized exposure, th column "Exposure (norm) (Measured)". However it is not required to normalize to any distance and in this case is "normalized exposure" = "measured exposure".
Calibration (Set value)	It is required to have calibration column. The value is used when getting the g-factor for the corresponding target/filter.
HVL (measured)	This column is required if QuickHVL is used instead of a traditional HVL measurement.
HVL(AGD) (Measured)	In this column is the HVL for the AGD calculation specified. The value must be entered manually or linked automtatically from the HVL analysis.
AGD (Calculated)	This is the calculated average glandular dose. This value is compared against the pass/fail criteria you have specified.

3.2.6.10 AGD(EUREF)

The AGD(EUREF) analysis is used to evaluate the average glandular dose according to the European protocol, ***European Protocol for the Quality Control of the Physical and Technical Aspects of Mammography Screening, Appendices, 2005***. Supported target/filter combinations are: Mo/30 µm Mo, Mo/25 µm Rh, Rh/25 µm Rh, Rh/1 mm Al, W/50 µm Rh and W/0.5 mm Al. (This analysis is only using one row in your test). You can read the topic Add analysis to see how you add the analysis to a test.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

Typical AGD(EUREF) test using traditional HVL measurement

This example shows how the template looks like when HVL is evaluated with a traditional HVL measurement (by adding filters until the measured dose is reduced to half).

Set kV (kV)	Compr. paddle	Phantom (mm)
26	Yes	45

View / Select	#	Calibration	HVL(AGD) (mm Al)	Exposure (norm) (mGy)	Set Added filtr. (mm Al)	AGD (mGy)
	1	Mo/30 µm Mo		3,240	0,00	
	2	Mo/30 µm Mo		2,820	0,10	
	3	Mo/30 µm Mo		2,290	0,20	
	4	Mo/30 µm Mo		1,640	0,30	
	5	Mo/30 µm Mo		1,340	0,40	
	6	Mo/30 µm Mo			0,50	
	7	Mo/30 µm Mo	0,323	5,300		0,9689

Half Value Layer

HVL is 0,323 mm Al

AGD (EUREF)

Result: Pass

AGD for Mo/30 µm Mo at 26,0 kV is 0,9689 mGy (Max allowed is 2,500 mGy)

Half value layer: 0,323 mm Al
Entrance surface air kerma (ESAK): 5,300 mGy

(Calculated for a 53 mm standard breast and a glandularity of 29%.)

Typical AGD(EUREF) test using Quick HVL

This example shows how the template looks like when HVL is evaluated by using the Quick HVL (Quick HVL is the HVL value measured with each exposure, the "1-shot HVL"). All measured data are acquired with one exposure.

Phantom (mm)	Set kV (kV)	Compr. paddle
50	30	Yes

View / Select	#	Calibration	Exposure (norm) (mGy)	HVL (mm Al)	HVL(AGD) (mm Al)	AGD (mGy)
	1	Mo/30 µm Mo	4,820	0,341	0,341	0,8424

Half Value Layer

HVL is 0,341 mm Al

Average glandular dose

Result: Pass

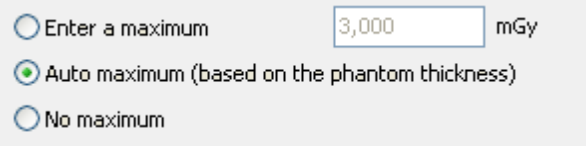
AGD for Mo/30 µm Mo at 30,0 kV is 0,8424 mGy (Max allowed is 3,000 mGy)

Half value layer: 0,341 mm Al
Entrance surface air kerma (ESAK): 4,820 mGy

(Calculated for a 60 mm standard breast and a glandularity of 20%.)

Default pass/fail criteria

When you add the AGD(EUREF) analysis the following pass/fail criteria is shown:



You can specify your own value or use a value from the table given by the European protocol:

Thickness of PMMA (mm)	*Equivalent breast thickness (mm)*	Maximum average glandular dose to equivalent breast	
		Aceptable level (mGy)	*Achievable level (mGy)*
20	*21*	< 1.0	*< 0.6*
30	*32*	< 1.5	*< 1.0*
40	*45*	< 2.0	*< 1.6*
45	*53*	< 2.5	*< 2.0*
50	*60*	< 3.0	*< 2.4*
60	*75*	< 4.5	*< 3.6*
70	*90*	< 6.5	*< 5.1*

When "Auto" is used the value "Accepted level" is used.

Default result

AGD (EUREF)

Result: Pass

AGD for Mo/30 µm Mo at 27,0 kV is 0,4176 mGy (Max allowed is 3,000 mGy)

Half value layer: 0,323 mm Al
Entrance surface air kerma (ESAK): 2,500 mGy

(Calculated for a 6,000 cm standard breast and a glandularity of 20%.)

Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AGD(EUREF) analysis looks like this:

$Title

Result: $TestResult

AGD for $TargetFilter at $kVp kV is $AGD $AGDUnit (Max allowed is $LimitMaxAGD $AGDUnit)

Half value layer: $HVL mm Al
Entrance surface air kerma (ESAK): $ESAK $ESAKUnit

(Calculated for a $EqBreastThickness $PhantomUnit standard breast and a glandularity of $Glandularity%.)

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AGD(EUREF) analysis:

$Title (Specified title)
$TestResult (Pass or fail text, the overall result for the test)
$Result (Analysis result)
$AGDUnit (AGD unit)
$AGD (Average glandular dose)
$LimitMaxAGD (Max allowed AGD)
$RowNo (Row number used for the analysis)
$kVp (Set kVp)
$HVL (Used HVL)
$TargetFilter (Calibration)
$SSD (Distance to which the AGD is normalized)
$ESAKUnit (ESAK unit)
$ESAK (Measured exposure)
$gPB (Used g(PB))
$cFactor (Used c factor)
$sFactor (Used s factor)
$RefmAs (Reference mAs to which AGD is normalized)
$SetmAs (Set mAs)
$PhantomThickness (Phantom thickness)
$PhantomUnit (Unit for phantom thickness and breast thickness)
$EqBreastThickness (Equivalent breast thickness)
$Glandularity (Glandilarity (%) of equivalent breast)

Calculations

The AGD(EUREF), $AGD, is calculated as:

$AGD = $ESAK * $gPB * $cFactor * $sFactor

where

$ESAK = normalized entrance air kerma, measured exposure value (from the column "Exposure (norm) (Measured)")

$gPB is the g(PB) factor. It is dependant on HVL and the phantom thickness (corresponds to an equivalent breast thickness):

Table A5.1: g-factors for breasts simulated with PMMA

PMMA thickness (mm)	Equivalent breast thickness (mm)	g-factors (mGy/mGy) HVL (mm Al)							
		0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60
20	21	0.329	0.378	0.421	0.460	0.496	0.529	0.559	0.585
30	32	0.222	0.261	0.294	0.326	0.357	0.388	0.419	0.448
40	45	0.155	0.183	0.208	0.232	0.258	0.285	0.311	0.339
45	53	0.130	0.155	0.177	0.198	0.220	0.245	0.272	0.295
50	60	0.112	0.135	0.154	0.172	0.192	0.214	0.236	0.261
60	75	0.088	0.106	0.121	0.136	0.152	0.166	0.189	0.210
70	90		0.086	0.098	0.111	0.123	0.136	0.154	0.172
80	103		0.074	0.085	0.096	0.106	0.117	0.133	0.149

Click to compress

$cFactor is the c-factor, it is also dependant on HVL and the phantom thickness:

Table A5.2: c-factors for breasts simulated with PMMA

PMMA thickness (mm)	Equivalent breast thickness (mm)	Glandularity of equivalent breast	c-factors HVL (mm Al)						
			0.30	0.35	0.40	0.45	0.50	0.55	0.60
20	21	97	0.889	0.895	0.903	0.908	0.912	0.917	0.921
30	32	67	0.940	0.943	0.945	0.946	0.949	0.952	0.953
40	45	41	1.043	1.041	1.040	1.039	1.037	1.035	1.034
45	53	29	1.109	1.105	1.102	1.099	1.096	1.091	1.088
50	60	20	1.164	1.160	1.151	1.150	1.144	1.139	1.134
60	75	9	1.254	1.245	1.235	1.231	1.225	1.217	1.207
70	90	4	1.299	1.292	1.282	1.275	1.270	1.260	1.249
80	103	3	1.307	1.299	1.292	1.287	1.283	1.273	1.262

Click to compress

$sFactor is the s-factor, it is dependant on the target/filter:

Table A5.4: *s*-factors for clinically used spectra [Dance et al 2000]

Spectrum	s-factor
Mo/Mo	1.000
Mo/Rh	1.017
Rh/Rh	1.061
Rh/Al	1.044
W/Rh	1.042
W/Al	1.05*

Click to compress

*) the s-factor for W/Al is taken from the IAEA protocol; ***IAEA, Technical Report Series no. 457, Dosimetry in Diagnostic Radiology: An International Code of Practice, page 155-163, 2007, ISSN 0074-1914.***

Required columns (or general settings)

The following columns are required for the AGD(ACR) analysis:

Parameter	Description
Exposure (norm) (Measured)	The AGD(ACR) analysis is always using the normalized exposure, th column "Exposure (norm) (Measured)". However it is not required to normalize to any distance and in this case is "normalized exposure" = "measured exposure".
Calibration (Set value)	It is required to have calibration column. The value is used when getting the g-factor for the corresponding target/filter.
Phantom (Set value)	This is the phantom thickness (corresponds to a breast thickness). This column is required.
HVL(Measured)	This column is required if QuickHVL is used instead of a traditional HVL measurement.
HVL(AGD) (Measured)	In this column is the HVL for the AGD calculation specified. The value must be entered manually or linked automtatically from the HVL analysis.
AGD (Calculated)	This is the calculated average glandular dose. This value is compared against the pass/fail criteria you have specified.

3.2.6.11 AGD(IAEA)

The AGD(IAEA) analysis is used to evaluate the average glandular dose according to the European protocol, ***IAEA, Technical Report Series no. 457, Dosimetry in Diagnostic Radiology: An International Code of Practice, page 155-163, 2007, ISSN 0074-1914***. Supported target/filter combinations are: Mo/30 µm Mo, Mo/25 µm Rh, Rh/25 µm Rh, Rh/1 mm Al, W/50 µm Rh and W/0.5 mm Al. (This analysis is only using one row in your test). You can read the topic Add analysis to see how you add the analysis to a test.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

Typical AGD(IAEA) test using traditional HVL measurement

This example shows how the template looks like when HVL is evaluated with a traditional HVL measurement (by adding filters until the measured dose is reduced to half).

For this analysis you should specify the set mAs and the mAs value shown on the mammographic unit after the exposure should be entered as Ref mAs.

Set kV (kV)	Compr. paddle	Set mAs (mAs)
26	Yes	160

View / Select	#	Calibration	HVL(AGD) (mm Al)	Ref mAs (mAs)	Exposure (norm) (mGy)	Set Added filtr. (mm Al)	AGD (mGy)
	1	Mo/30 µm Mo			3,240	0,00	
	2	Mo/30 µm Mo			2,820	0,10	
	3	Mo/30 µm Mo			2,290	0,20	
	4	Mo/30 µm Mo			1,640	0,30	
	5	Mo/30 µm Mo			1,340	0,40	
	6	Mo/30 µm Mo				0,50	
	7	Mo/30 µm Mo	0,323	172,3	5,707		1,079

Half Value Layer

HVL is 0,323 mm Al

AGD (IAEA)

Result: Pass

AGD for Mo/30 µm Mo at 26,0 kV is 1,079 mGy (Max allowed is 3,000 mGy)

Half value layer: 0,323 mm Al
Incident air kerma (Ki): 5,707 mGy

Typical AGD(IAEA) test using Quick HVL

This example shows how the template looks like when HVL is evaluated by using the Quick HVL (Quick HVL is the HVL value measured with each exposure, the "1-shot HVL"). All measured data are acquired with one exposure.

For this analysis you should specify the set mAs and the mAs value shown on the mammographic unit after the exposure should be entered as Ref mAs.

Set kV (kV)	Compr. paddle	Set mAs (mAs)
26	Yes	160

View / Select	#	Calibration	Ref mAs (mAs)	Exposure (norm) (mGy)	HVL (mm Al)	HVL(AGD) (mm Al)	AGD (mGy)
	1	Mo/30 µm Mo	164,0	5,258	0,367	0,367	1,100

Half Value Layer

HVL is 0,367 mm Al

Average glandular dose

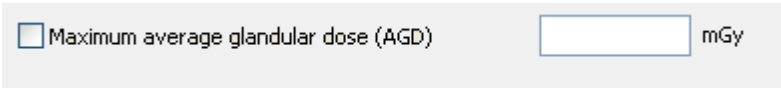
Result: Pass

AGD for Mo/30 µm Mo at 26,0 kV is 1,100 mGy (Max allowed is 3,000 mGy)

Half value layer: 0,367 mm Al
Incident air kerma (Ki): 5,258 mGy

Default pass/fail criteria

When you add the AGD(IAEA) analysis the following pass/fail criteria is shown:



The IAEA Code of Practice doesn't specify any pass/fail criteria, you have to specify them yourself.

Default result

AGD (IAEA)

Result: Pass

AGD for Mo/30 µm Mo at 27,0 kV is 0,4728 mGy (Max allowed is 7,000 mGy)

Half value layer: 0,323 mm Al
Incident air kerma (Ki): 2,500 mGy

Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AGD(IAEA) analysis looks like this:

$Title

Result: $TestResult

AGD for $TargetFilter at $kVp kV is $AGD $AGDUnit (Max allowed is $LimitMaxAGD $AGDUnit)

Half value layer: $HVL mm Al
Incident air kerma (Ki): $Ki $KiUnit

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AGD(IAEA) analysis:

$Title (Specified title)
$TestResult (Pass or fail text, the overall result for the test)
$Result (Analysis result)
$AGDUnit (AGD unit)
$AGD (Average glandular dose)
$LimitMaxAGD (Max allowed AGD)
$RowNo (Row number used for the analysis)
$kVp (Set kVp)
$HVL (Used HVL)
$TargetFilter (Calibration)
$SSD (Distance to which the AGD is normalized)
$KiUnit (Ki unit)
$Ki (Measured exposure)
$CDG50KiPMMAFactor (Used CDG50,Ki,PMMA factor)
$SFactor (Used s factor)
$RefmAs (Reference mAs to which AGD is normalized)
$SetmAs (Set mAs)

Calculations

The AGD(IAEA), $AGD, is calculated as:

$AGD = $Ki * $CDG50KiPMMAFactor * $sFactor

where

$Ki = normalized incident air kerma, measured exposure value (from the column "Exposure (norm) (Measured)"). The IAEA Code of Practice says that the incident air kerma should be normalized to the mAs value (Ref mAs) shown after an exposure with the phantom in the beam using AEC. When measuring the incident air kerma a mAs set value is used as close as possible to the Ref mAs value.

$CDG50KiPMMAFactor is the CDG50,Ki,PMMA factor. It is dependant on HVL:

HVL (mm Al)	$C_{DG50,Ki,PMMA}$
0,25	0,149
0,3	0,177
0,35	0,202
0,4	0,223
0,45	0,248
0,5	0,276
0,55	0,304
0,6	0,326
0,65	0,349

$sFactor is the s-factor, it is dependant on the target/filter:

Calibration	s factor
Mo/30 umMo	1
Mo/25 um Rh	1,017
Rh/25 um Rh	1,061
Rh/1 mm Al	1,044
W/50 um Rh	1,042
W/0.5 mm Al*	1,05

Required columns (or general settings)

The following columns are required for the AGD(IAEA) analysis:

Parameter	Description
Exposure (norm) (Measured)	The AGD(ACR) analysis is always using the normalized exposure, th column "Exposure (norm) (Measured)". However it is not required to normalize to any distance and in this case is "normalized exposure" = "measured exposure".
Calibration (Set value)	It is required to have calibration column. The value is used when getting the g-factor for the corresponding target/filter.
Ref mAs (Measured)	This is the reference mAs that was used by the generator with the phantom in the field and AEC.
Set mAs (Set value)	This is the mAs set value used when measuring the incident air kerma without using AEC.
HVL(measured)	This column is required if QuickHVL is used instead of a traditional HVL measurement.
HVL(AGD) (Measured)	In this column is the HVL for the AGD calculation specified. The value must be entered manually or linked automtatically from the HVL analysis.
AGD (Calculated)	This is the calculated average glandular dose. This value is compared against the pass/fail criteria you have specified.

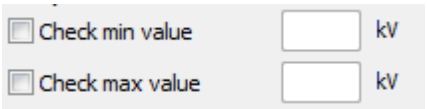
3.2.6.12 Min/Max

The Min/Max analysis is used to evaluate that a certain parameter is within/above/below a specified limit (s). The parameter analyzed is compared to the specified min and/or max limit. The min/max analysis can be used with all measured parameters and user-defined calculated parameters. You can read the topic Add analysis to see how you add the analysis to a test.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

Default pass/fail criteria

When you add the Min/Max analysis the following pass/fail criteria is shown:



There are no defaults, you must always specify the limits you want to have when you add a Min/Max analysis.

Default result



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text Min/Max analysis looks like this:



This text can be modified and more macros can be used to show more calculated results, for example

the relative difference. The following macros are available for the Min/Max analysis:

$Title (Specified title)

$TestResult (Pass or fail text, the overall result for the test)

$Result (Analysis result)

$GraphAbs (Graphical representation of the results)

$MinLimit (Min value limit)

$MaxLimit (Max value limit)

$MinValue (Min value)

$MaxValue (Max value)

$Unit (The current unit)

Calculations

The following evaluation is done:

$MinLimit = measured value = $MaxLimit

If either of min or max limit is not specified the corresponding comparison is not performed.

Required columns (or general settings)

The following columns are required for the Accuracy analysis:

Parameter	Description
Measured value or User-calc value	A measured value or a user-calculated value is required for this analysis.

3.2.6.13 Checklist

The Checklist analysis is used to evaluate a checklist. The checklist analysis looks at the number of warnings and failings in a checklist.

The parameter is compared against the specified min and/or max limit. The min/max analysis can be used with all measured parameters and the user-defined calculated parameter. You can read the topic Add analysis to see how you add the analysis to a test.

If you want to modify the standard analysis, see topic Modify analysis and Advanced analysis for more information.

Typical checklist

View / Select	#	Question	Answer	Recommendation
	1	**OPERATOR PROTECTION**		
	2	Exposure switch mounted properly?	Yes	
	3	Gloves and aprons available	Yes	
	4	Gloves and aprons in good condition?	No	
	5	**PATIENT PROTECTION**		
	6	Gonadal protection provided?	Yes	
	7	Technique charts available?	Yes	
	8	Filter permanently installed?	Yes	
	9	**AREA SURVEY**		
	10	Approved warning sign on door(s)?	Yes	
	11	**EQUIPMENT**		
	12	Collimation functioning properly?	Yes	
	13	Audible exposure signal?	Yes	
	14	X-Ray warning sign on unit?	Yes	
	15	All controls, meters, lights and indicators working?	Yes	

Click to compress

Default pass/fail criteria

There are no pass/fail criteria for this analysis.

Default result

Checklist

Result: Pass

Total of 0 question(s) failed.
There were 0 warning(s).

Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text Checklist analysis looks like this:

$Title

Result: $TestResult

Total of $NoOfFails question(s) failed.
There were $NoOfWarnings warning(s).

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the Checklist analysis:

$Title (Specified title)
$TestResult (Pass or fail text, the overall result for the test)
$Result (Analysis result)
$TotalNoOfQuestions (Total number of questions)
$NoOfFails (Number of failed questions)
$NoOfWarnings (Number of warnings)

Calculations

No calculations are done.

Required columns (or general settings)

The following columns are required for the analysis:

Parameter	Description
Answer	This column is required.

3.2.6.14 AEC kV compensation

The AEC kV compensation analysis is used to test the performance of the automatic exposure control. You can use exposure values or optical density (O.D.) for the evaluation. This analysis can calculate the deviation from mean value, mean value and standard deviation. You can specify pass/fail criteria for these parameters. You can read the topic Add analysis to see how you add the analysis to a test.

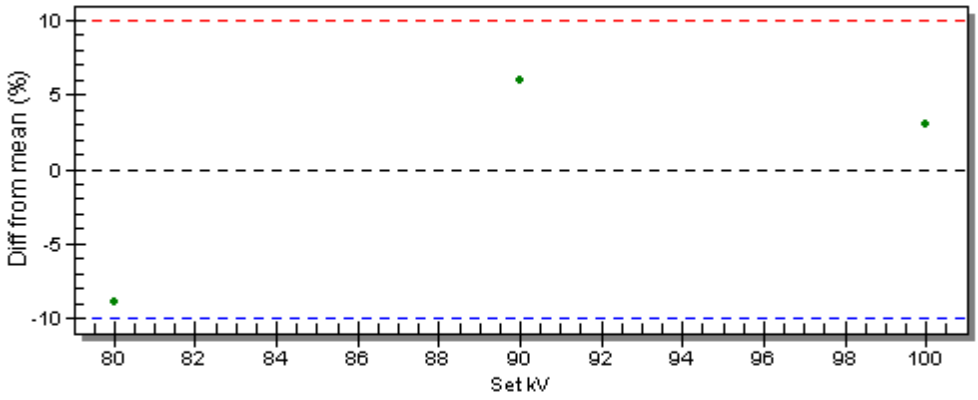
By default, deviation from mean value, mean value and standard deviation are calculated. If you want to include the standard deviation also, you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

Typical AEC kV compensation test (Exposure)

View / Select	#	Set kV (kV)	Exposure (mGy)	Exposure diff from mean (%)
	1	80,0	1,530	-8,9
	2	90,0	1,780	6,0
	3	100,0	1,730	3,0

AEC kV compensation

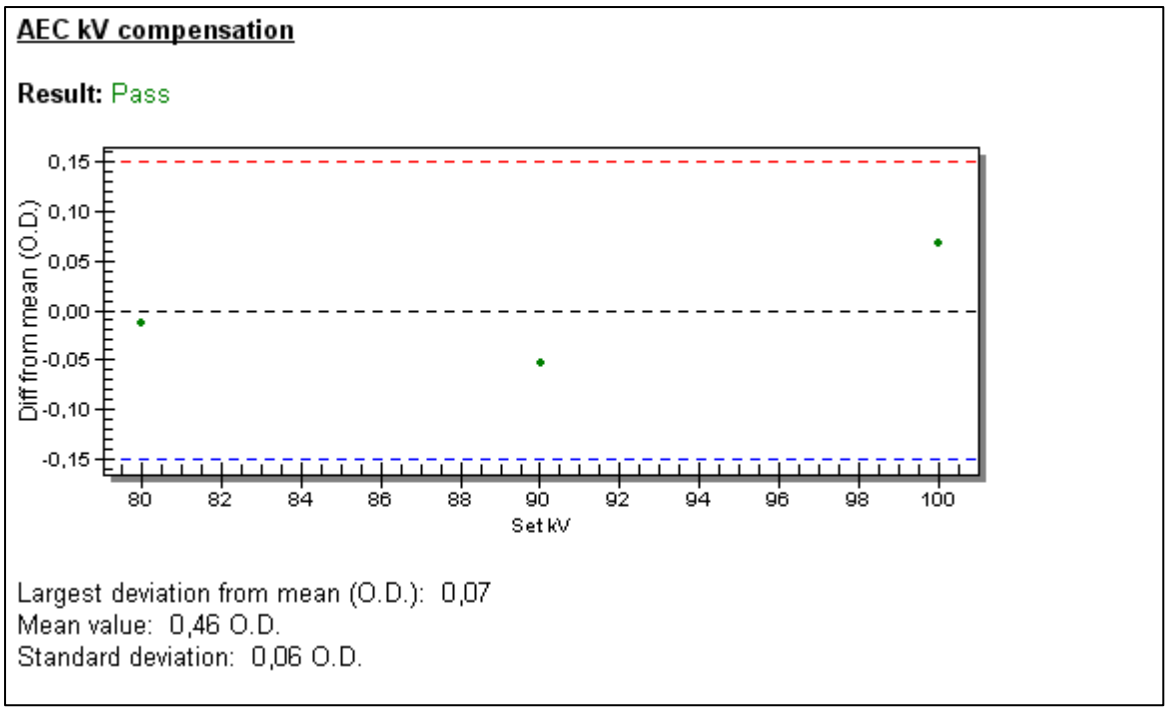
Result: Pass



Largest deviation from mean (%): 8,9
Mean value: 1,680 mGy
Standard deviation: 0,1323 mGy

Typical AEC kV compensation test (O.D.)

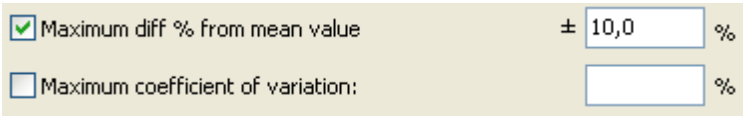
View / Select	#	Set kV (kV)	Meas O.D.	Diff from mean (O.D.)
	1	80,0	0,45	-0,01
	2	90,0	0,41	-0,05
	3	100,0	0,53	0,07



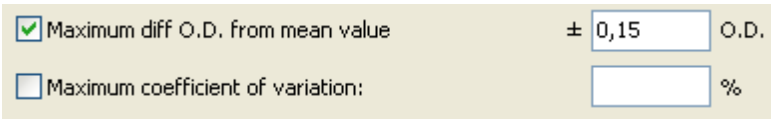
Default pass/fail criteria

When you add the AEC kV compensation analysis the following pass/fail criteria is shown. By default is only maximum difference from the mean value tested:

If Exposure is used:

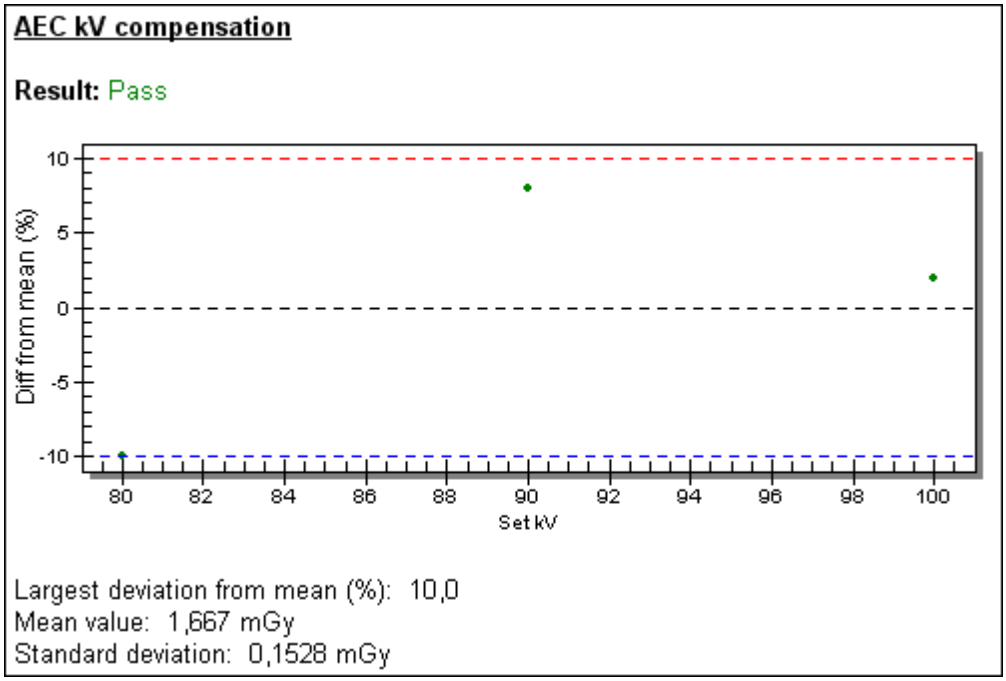


If O.D. is used:



You must modify the layout to see the results of the additional parameter Coefficient of variation.

Default result (Exposure)



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AEC kV compensation analysis looks like this:

$Title

Result: $TestResult

$Graph

Largest deviation from mean ($UnitForDeviation): $MaxDevFromMean
Mean value: $MeanValue $Unit
Standard deviation: $StandardDeviation $Unit

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AEC kV compensation analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$MaxDevFromMean (Maximum deviation from mean value)
$LimitForMaxDevFromMean (Allowed deviation from mean)
$UnitForDeviation (% or O.D. depending on method used)
$SetkVpForMaxDev (Set kVp where maximum deviation occurred)
$MeanValue (Mean value)
$StandardDeviation (Standard deviation)
$CoeffOfVariation (Coefficient of variation)
$LimitForCoeffOfVariation (Limit for Coefficient of variation)
$Graph (Graphical representation of results)
$Unit (The current unit (O.D. or used Exposure unit))

Calculations

The mean ($MeanValue) is calculated as:

$MeanValue = ($Value_1$ + $Value_2$ + ... + $Value_n$) / n (based on rows included in the AEC kV compensation analysis)

for each row included in the analysis the following is calculated:

If Exposure is used:
Exposure diff from mean (%) = 100 * (Exposure value - Mean value) / Mean value

If optical density (O.D.) is used:
Diff from mean (O.D.) = 100 * (Meas O.D. - Mean value) / Mean value

The macro $MaxDevFromMean is set to the maximum of these values.

Coefficient of variation is calculated as:

$CoeffOfVariation = $StandardDeviation / $MeanValue

where the Standard deviation is calculated as:

$StandardDeviation = v [((X_1 - $MeanValue)^2 + ($X_2$ - $MeanValue)^2 + ... + ($X_n$ - $MeanValue)^2)/n]

Required columns (or general settings)

The following columns are required for the AEC kV compensation analysis:

Parameter	Description
Measured value or Exposure or O.D.	The measured values are used to calculate the difference from mean value, coefficient of variation and standard deviation.
diff from mean (%) or diff from mean(O.D.)	This is the calculated relative difference between the each individual measured value and the mean value of all measured values. This column is optional, however, it is recommended to have this column if this parameter is evaluated since the indication of failing exposures is made in this column.

3.2.6.15 AEC mA compensation

The AEC mA compensation analysis is used to test the performance of the automatic exposure control. You can use exposure values or optical density (O.D.) for the evaluation. This analysis can calculate the deviation from mean value, mean value and standard deviation. You can specify pass/fail criteria for these parameters. You can read the topic Add analysis to see how you add the analysis to a test.

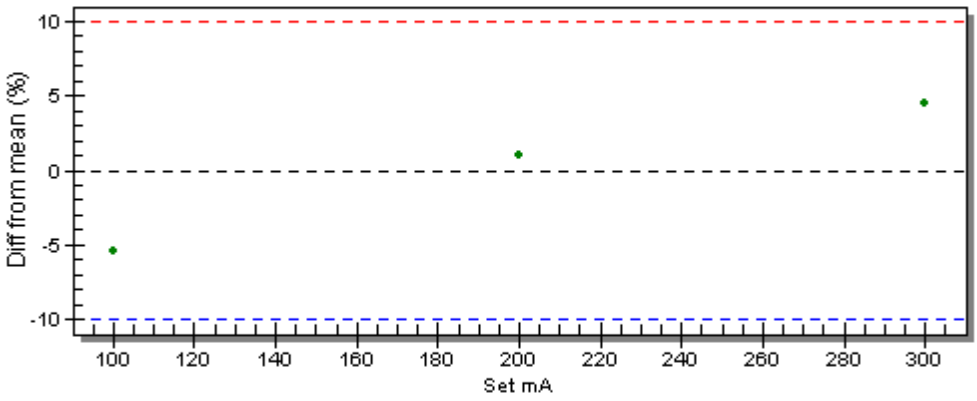
By default, deviation from mean value, mean value and standard deviation are calculated. If you want to include the standard deviation also, you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

Typical AEC mA compensation test (Exposure)

View / Select	#	Set mA (mA)	Exposure (mGy)	Exposure diff from mean (%)
	1	100,0	16,30	-5,4
	2	200,0	17,40	1,0
	3	300,0	18,00	4,4

AEC mA compensation

Result: Pass



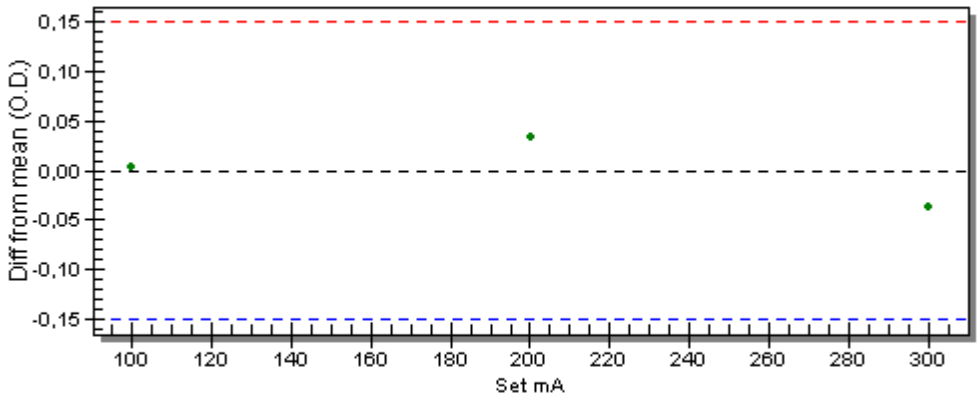
Largest deviation from mean (%): 5,4
Mean value: 17,23 mGy
Standard deviation: 0,8622 mGy

Typical AEC mA compensation test (O.D.)

View / Select	#	Set mA (mA)	Meas O.D.	Diff from mean (O.D.)
	1	100,0	0,56	0,00
	2	200,0	0,59	0,03
	3	300,0	0,52	-0,04

AEC mA compensation

Result: Pass

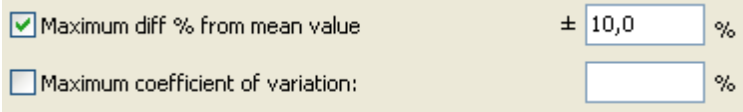


Largest deviation from mean (O.D.): 0,04
Mean value: 0,56 O.D.
Standard deviation: 0,04 O.D.

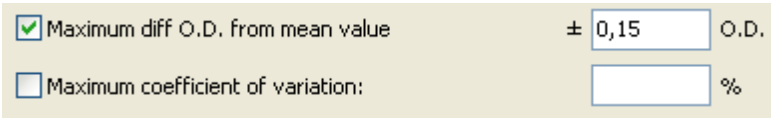
Default pass/fail criteria

When you add the AEC mA compensation analysis the following pass/fail criteria is shown. By default is only maximum difference from the mean value tested:

If Exposure is used:

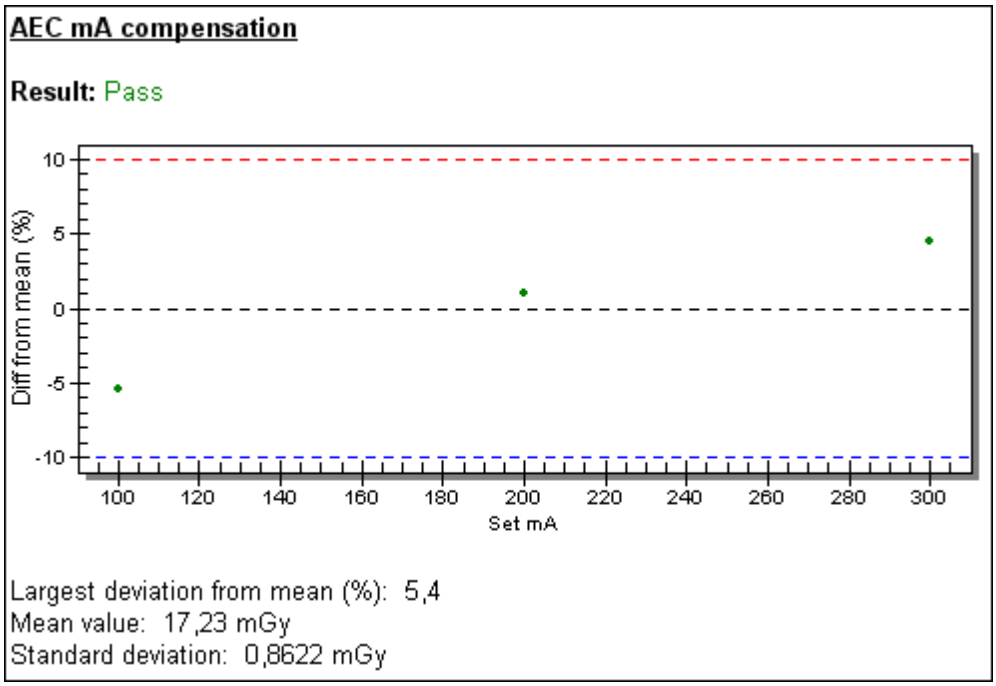


If O.D. is used:



You must modify the layout to see the results of the additional parameter Coefficient of variation.

Default result (Exposure)



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AEC mA compensation analysis looks like this:

$Title

Result: $TestResult

$Graph

Largest deviation from mean ($UnitForDeviation): $MaxDevFromMean
Mean value: $MeanValue $Unit
Standard deviation: $StandardDeviation $Unit

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AEC mA compensation analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$MaxDevFromMean (Maximum deviation from mean value)
$LimitForMaxDevFromMean (Allowed deviation from mean)
$UnitForDeviation (% or O.D. depending on method used)
$SetkVpForMaxDev (Set kVp where maximum deviation occurred)
$MeanValue (Mean value)
$StandardDeviation (Standard deviation)
$CoeffOfVariation (Coefficient of variation)
$LimitForCoeffOfVariation (Limit for Coefficient of variation)
$Graph (Graphical representation of results)
$Unit (The current unit (O.D. or used Exposure unit))

Calculations

The mean ($MeanValue) is calculated as:

$MeanValue = ($Value_1$ + $Value_2$ + ... + $Value_n$) / n (based on rows included in the AEC mA compensation analysis)

for each row included in the analysis the following is calculated:

If Exposure is used:
Exposure diff from mean (%) = 100 * (Exposure value - Mean value) / Mean value

If optical density (O.D.) is used:
Diff from mean (O.D.) = 100 * (Meas O.D. - Mean value) / Mean value

The macro $MaxDevFromMean is set to the maximum of these values.

Coefficient of variation is calculated as:

$CoeffOfVariation = $StandardDeviation / $MeanValue

where the Standard deviation is calculated as:

$StandardDeviation = v [((X_1 - $MeanValue)^2 + ($X_2$ - $MeanValue)^2 + ... + ($X_n$ - $MeanValue)^2)/n]

Required columns (or general settings)

The following columns are required for the AEC mA compensation analysis:

Parameter	Description
Measured value or Exposure or O.D.	The measured values are used to calculate the difference from mean value, coefficient of variation and standard deviation.
diff from mean (%) or diff from mean(O.D.)	This is the calculated relative difference between the each individual measured value and the mean value of all measured values. This column is optional, however, it is recommended to have this column if this parameter is evaluated since the indication of failing exposures is made in this column.

3.2.6.16 AEC reproducibility

The AEC reproducibility analysis is used to test the performance of the automatic exposure control. You can use exposure values or optical density (O.D.) for the evaluation. This analysis can calculate the deviation from mean value, mean value and standard deviation. You can specify pass/fail criteria for these parameters. You can read the topic Add analysis to see how you add the analysis to a test.

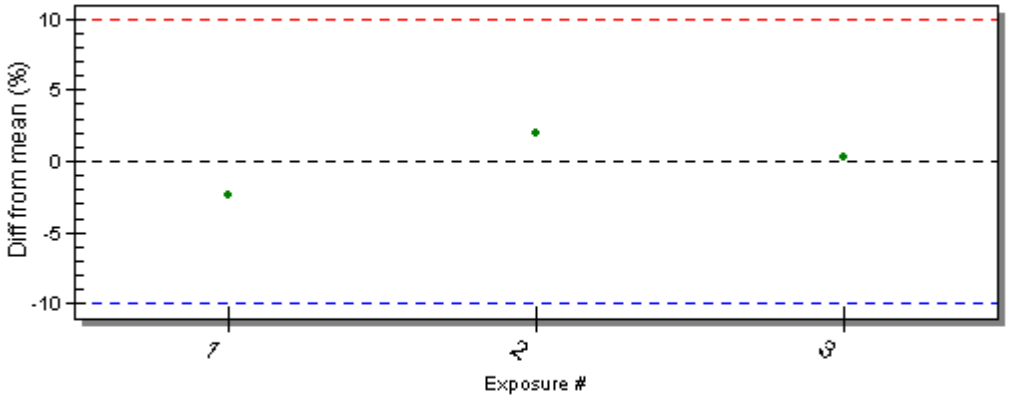
By default, deviation from mean value, mean value and standard deviation are calculated. If you want to include the standard deviation also, you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

Typical AEC reproducibility test (Exposure)

View / Select	#	Exposure (mGy)	Exposure diff from mean (%)
	1	3,193	-2,3
	2	3,335	2,0
	3	3,281	0,3

AEC reproducibility

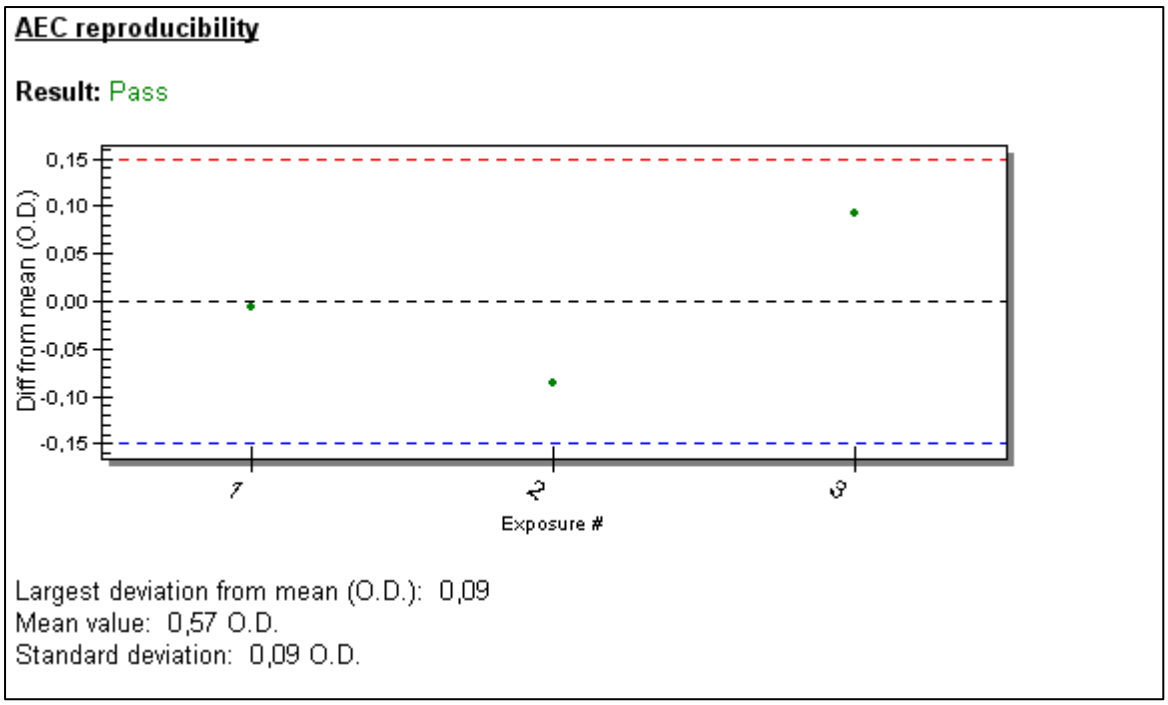
Result: Pass



Largest deviation from mean (%): 2,3
Mean value: 3,270 mGy
Standard deviation: 0,07168 mGy

Typical AEC reproducibility test (O.D.)

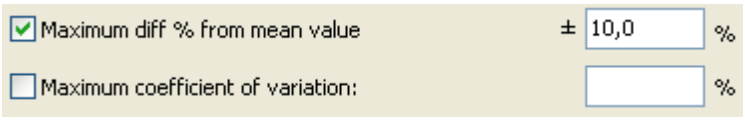
View / Select	#	Meas O.D.	Diff from mean (O.D.)
	1	0,56	-0,01
	2	0,48	-0,09
	3	0,66	0,09



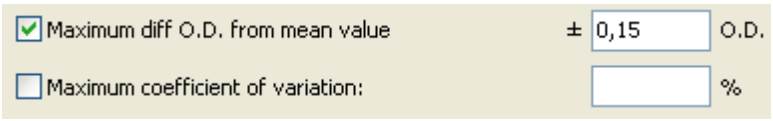
Default pass/fail criteria

When you add the AEC reproducibility analysis the following pass/fail criteria is shown. By default is only maximum difference from the mean value tested:

If Exposure is used:

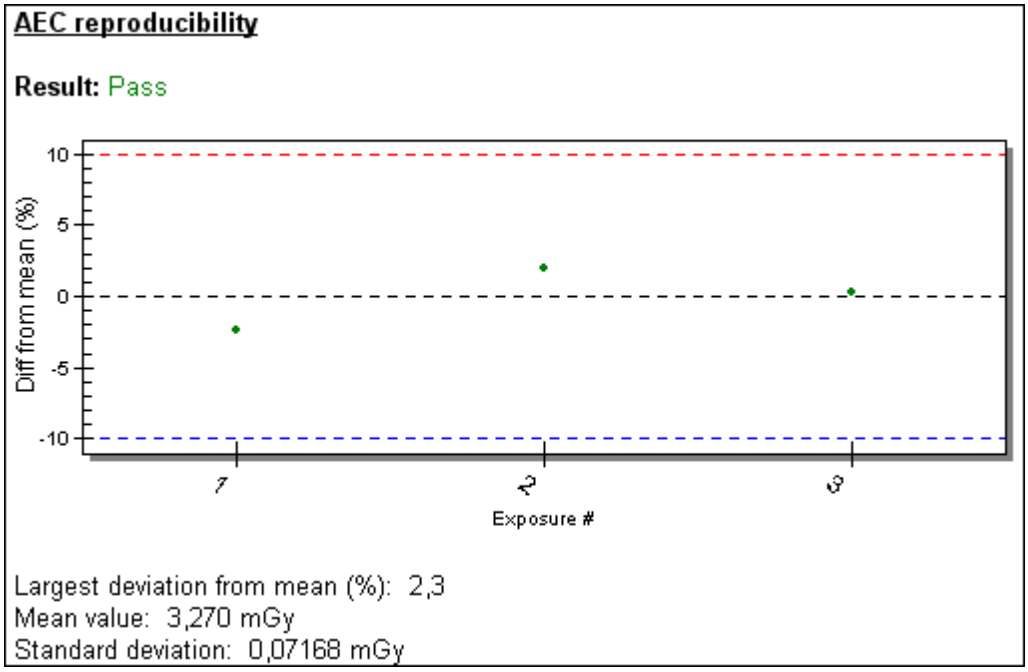


If O.D. is used:



You must modify the layout to see the results of the additional parameter Coefficient of variation.

Default result (Exposure)



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AEC reproducibility analysis looks like this:

$Title

Result: $TestResult

$Graph

Largest deviation from mean ($UnitForDeviation): $MaxDevFromMean
Mean value: $MeanValue $Unit
Standard deviation: $StandardDeviation $Unit

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AEC reproducibility analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$MaxDevFromMean (Maximum deviation from mean value)
$LimitForMaxDevFromMean (Allowed deviation from mean)
$UnitForDeviation (% or O.D. depending on method used)
$SetkVpForMaxDev (Set kVp where maximum deviation occurred)
$MeanValue (Mean value)
$StandardDeviation (Standard deviation)
$CoeffOfVariation (Coefficient of variation)
$LimitForCoeffOfVariation (Limit for Coefficient of variation)
$Graph (Graphical representation of results)
$Unit (The current unit (O.D. or used Exposure unit))

Calculations

The mean ($MeanValue) is calculated as:

$MeanValue = ($Value_1$ + $Value_2$ + ... + $Value_n$) / n (based on rows included in the AEC reproducibility analysis)

for each row included in the analysis the following is calculated:

If Exposure is used:
Exposure diff from mean (%) = 100 * (Exposure value - Mean value) / Mean value

If optical density (O.D.) is used:
Diff from mean (O.D.) = 100 * (Meas O.D. - Mean value) / Mean value

The macro $MaxDevFromMean is set to the maximum of these values.

Coefficient of variation is calculated as:

$CoeffOfVariation = $StandardDeviation / $MeanValue

where the Standard deviation is calculated as:

$StandardDeviation = v [((X_1 - $MeanValue)^2 + ($X_2$ - $MeanValue)^2 + ... + ($X_n$ - $MeanValue)^2)/n]

Required columns (or general settings)

The following columns are required for the AEC reproducibility analysis:

Parameter	Description
Measured value or Exposure or O.D.	The measured values are used to calculate the difference from mean value, coefficient of variation and standard deviation.
diff from mean (%) or diff from mean(O.D.)	This is the calculated relative difference between the each individual measured value and the mean value of all measured values. This column is optional, however, it is recommended to have this column if this parameter is evaluated since the indication of failing exposures is made in this column.

3.2.6.17 AEC reciprocity

The AEC reciprocity analysis is used to test the performance of the automatic exposure control. You can use exposure values or optical density (O.D.) for the evaluation. This analysis can calculate the deviation from mean value, mean value and standard deviation. You can specify pass/fail criteria for these parameters. You can read the topic Add analysis to see how you add the analysis to a test.

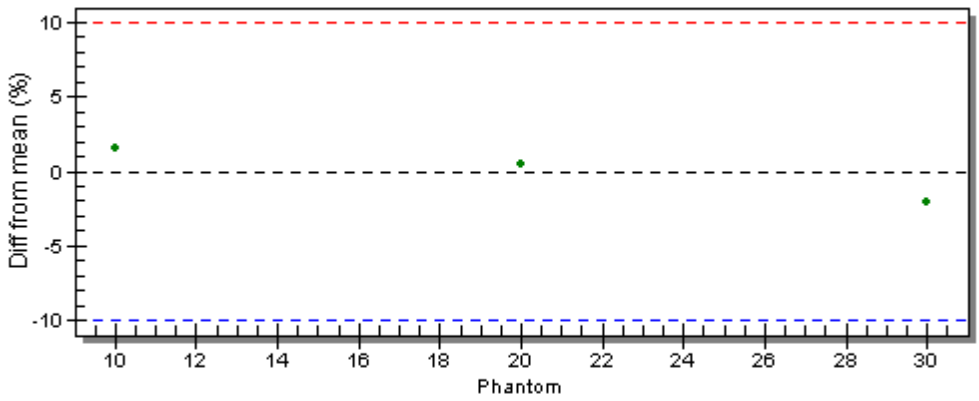
By default, deviation from mean value, mean value and standard deviation are calculated. If you want to include the standard deviation also, you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

Typical AEC reciprocity test (Exposure)

View / Select	#	Phantom (cm)	Exposure (mGy)	Exposure diff from mean (%)
	1	10	2,782	1,6
	2	20	2,751	0,5
	3	30	2,681	-2,1

AEC reciprocity

Result: Pass



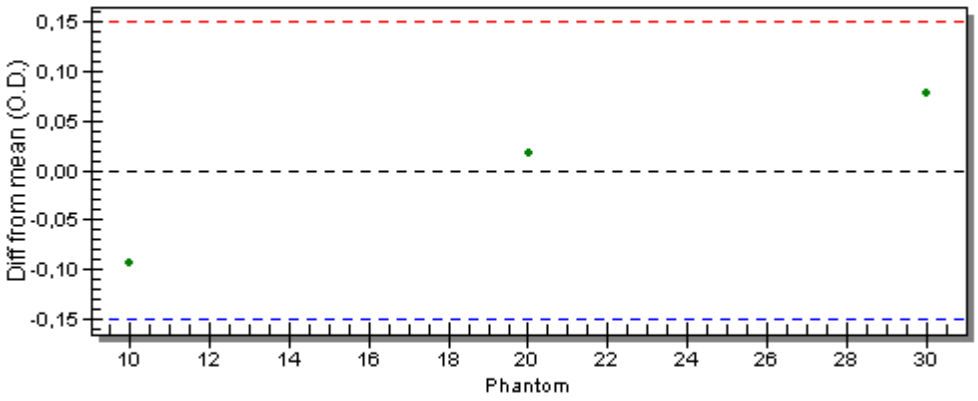
Largest deviation from mean (%): 2,1
Mean value: 2,738 mGy
Standard deviation: 0,05174 mGy

Typical AEC reciprocity test (O.D.)

View / Select	#	Phantom (cm)	Meas O.D.	Diff from mean (O.D.)
	1	10,00	0,45	-0,09
	2	20,00	0,56	0,02
	3	30,00	0,62	0,08

AEC reciprocity

Result: Pass

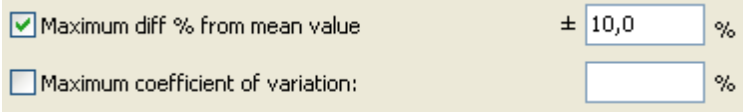


Largest deviation from mean (O.D.): 0,09
Mean value: 0,54 O.D.
Standard deviation: 0,09 O.D.

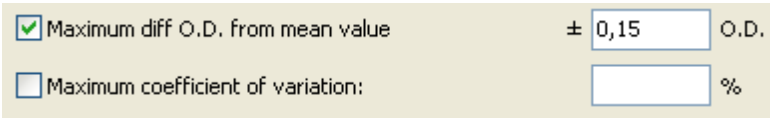
Default pass/fail criteria

When you add the AEC reciprocity analysis the following pass/fail criteria is shown. By default is only maximum difference from the mean value tested:

If Exposure is used:

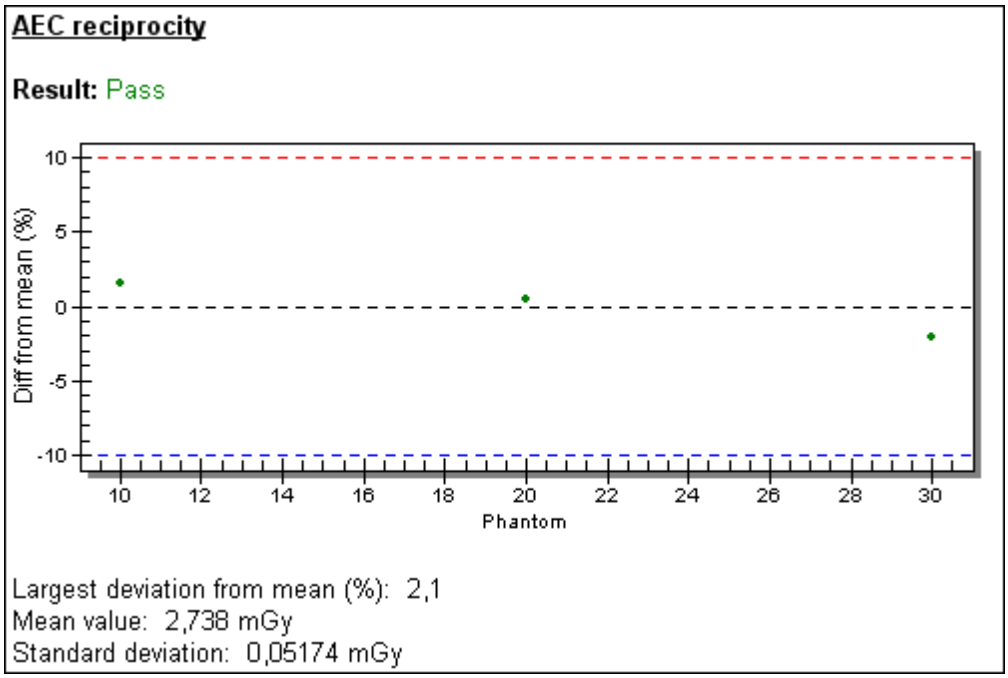


If O.D. is used:



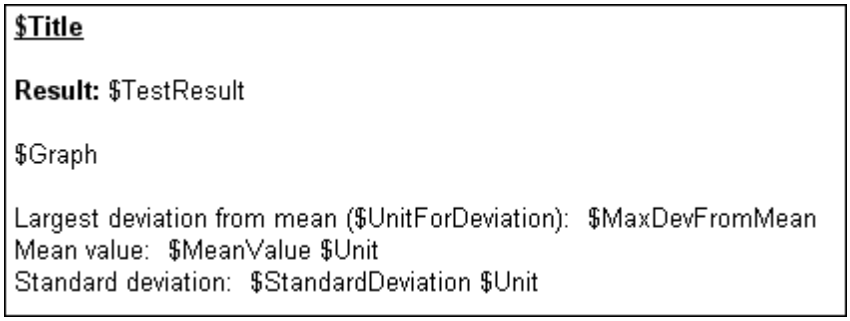
You must modify the layout to see the results of the additional parameter Coefficient of variation.

Default result (Exposure)



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AEC reciprocity analysis looks like this:



This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AEC reciprocity analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$MaxDevFromMean (Maximum deviation from mean value)
$LimitForMaxDevFromMean (Allowed deviation from mean)
$UnitForDeviation (% or O.D. depending on method used)
$SetkVpForMaxDev (Set kVp where maximum deviation occurred)
$MeanValue (Mean value)
$StandardDeviation (Standard deviation)
$CoeffOfVariation (Coefficient of variation)
$LimitForCoeffOfVariation (Limit for Coefficient of variation)
$Graph (Graphical representation of results)
$Unit (The current unit (O.D. or used Exposure unit))

Calculations

The mean ($MeanValue) is calculated as:

$MeanValue = ($Value_1$ + $Value_2$ + ... + $Value_n$) / n (based on rows included in the AEC reciprocity analysis)

for each row included in the analysis the following is calculated:

If Exposure is used:
Exposure diff from mean (%) = 100 * (Exposure value - Mean value) / Mean value

If optical density (O.D.) is used:
Diff from mean (O.D.) = 100 * (Meas O.D. - Mean value) / Mean value

The macro $MaxDevFromMean is set to the maximum of these values.

Coefficient of variation is calculated as:

$CoeffOfVariation = $StandardDeviation / $MeanValue

where the Standard deviation is calculated as:

$StandardDeviation = v [((X_1 - $MeanValue)^2 + ($X_2$ - $MeanValue)^2 + ... + ($X_n$ - $MeanValue)^2)/n]

Required columns (or general settings)

The following columns are required for the AEC reciprocity analysis:

Parameter	Description
Measured value or Exposure or O.D.	The measured values are used to calculate the difference from mean value, coefficient of variation and standard deviation.
diff from mean (%) or diff from mean(O.D.)	This is the calculated relative difference between the each individual measured value and the mean value of all measured values. This column is optional, however, it is recommended to have this column if this parameter is evaluated since the indication of failing exposures is made in this column.

3.2.6.18 AEC field balance

The AEC field balance analysis is used to test the performance of the automatic exposure control. You can use exposure values or optical density (O.D.) for the evaluation. This analysis can calculate the deviation from mean value, mean value and standard deviation. You can specify pass/fail criteria for these parameters. You can read the topic Add analysis to see how you add the analysis to a test.

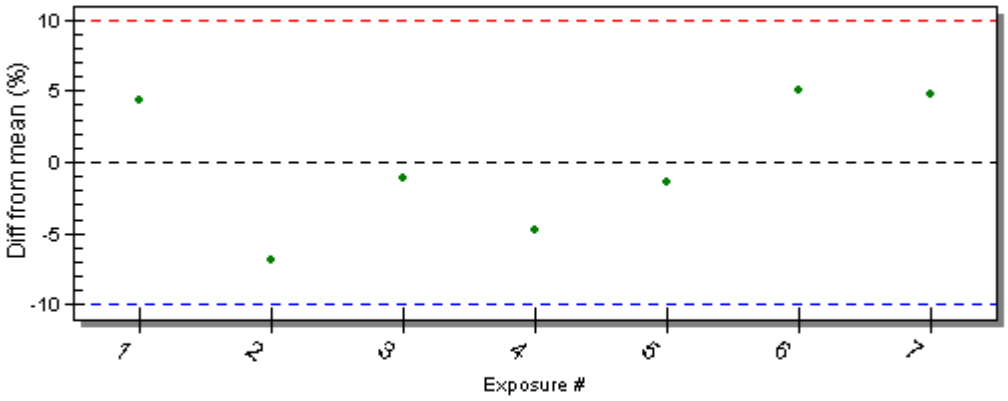
By default, deviation from mean value, mean value and standard deviation are calculated. If you want to include the standard deviation also, you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

Typical AEC field balance test (Exposure)

View / Select	#	Field selection	Exposure (mGy)	Exposure diff from mean (%)
	1	Left	2,871	4,4
	2	Center	2,561	-6,9
	3	Right	2,721	-1,1
	4	Left+Center	2,621	-4,7
	5	Center+Right	2,712	-1,4
	6	Left+Right	2,891	5,1
	7	Left+Center+Right	2,881	4,7

AEC field balance

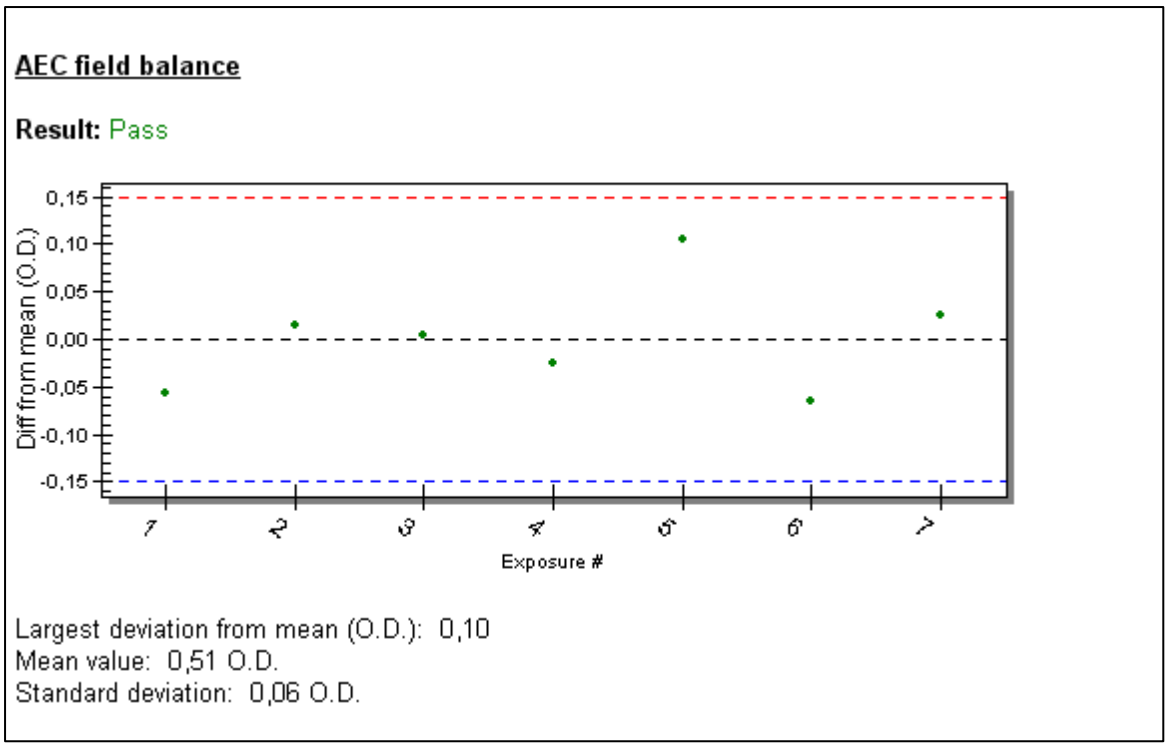
Result: Pass



Largest deviation from mean (%): 6,9
Mean value: 2,751 mGy
Standard deviation: 0,1331 mGy

Typical AEC field balance test (O.D.)

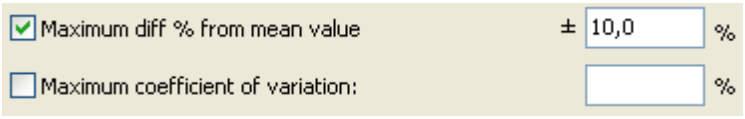
View / Select	#	Field selection	Meas O.D.	Diff from mean (O.D.)
	1	Left	0,45	-0,06
	2	Center	0,52	0,01
	3	Right	0,51	0,00
	4	Left+Center	0,48	-0,03
	5	Center+Right	0,61	0,10
	6	Left+Right	0,44	-0,07
	7	Left+Center+Right	0,53	0,02



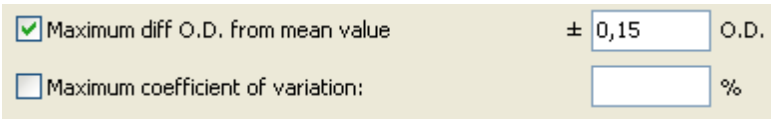
Default pass/fail criteria

When you add the AEC field balance analysis the following pass/fail criteria is shown. By default is only maximum difference from the mean value tested:

If Exposure is used:

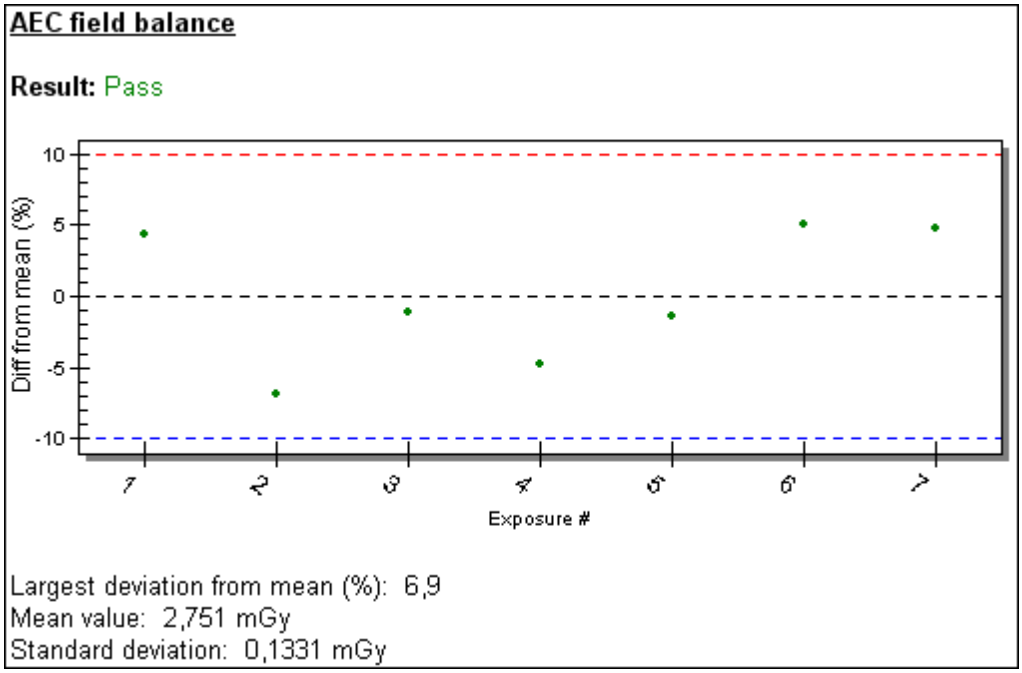


If O.D. is used:



You must modify the layout to see the results of the additional parameter Coefficient of variation.

Default result (Exposure)



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AEC field balance analysis looks like this:

$Title

Result: $TestResult

$Graph

Largest deviation from mean ($UnitForDeviation): $MaxDevFromMean
Mean value: $MeanValue $Unit
Standard deviation: $StandardDeviation $Unit

This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AEC field balance analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$MaxDevFromMean (Maximum deviation from mean value)
$LimitForMaxDevFromMean (Allowed deviation from mean)
$UnitForDeviation (% or O.D. depending on method used)
$SetkVpForMaxDev (Set kVp where maximum deviation occurred)
$MeanValue (Mean value)
$StandardDeviation (Standard deviation)
$CoeffOfVariation (Coefficient of variation)
$LimitForCoeffOfVariation (Limit for Coefficient of variation)
$Graph (Graphical representation of results)
$Unit (The current unit (O.D. or used Exposure unit))

Calculations

The mean ($MeanValue) is calculated as:

$MeanValue = ($Value_1$ + $Value_2$ + ... + $Value_n$) / n (based on rows included in the AEC field balance analysis)

for each row included in the analysis the following is calculated:

If Exposure is used:
Exposure diff from mean (%) = 100 * (Exposure value - Mean value) / Mean value

If optical density (O.D.) is used:
Diff from mean (O.D.) = 100 * (Meas O.D. - Mean value) / Mean value

The macro $MaxDevFromMean is set to the maximum of these values.

Coefficient of variation is calculated as:

$CoeffOfVariation = $StandardDeviation / $MeanValue

where the Standard deviation is calculated as:

$StandardDeviation = v [((X_1 - $MeanValue)^2 + ($X_2$ - $MeanValue)^2 + ... + ($X_n$ - $MeanValue)^2)/n]

Required columns (or general settings)

The following columns are required for the AEC field balance analysis:

Parameter	Description
Measured value or Exposure or O.D.	The measured values are used to calculate the difference from mean value, coefficient of variation and standard deviation.
diff from mean (%) or diff from mean(O.D.)	This is the calculated relative difference between the each individual measured value and the mean value of all measured values. This column is optional, however, it is recommended to have this column if this parameter is evaluated since the indication of failing exposures is made in this column.

3.2.6.19 AEC densitiy correction

The AEC density correction analysis is used to test the performance of the automatic exposure control. You can use exposure values or optical density (O.D.) for the evaluation. This analysis doesn't have any pass/fail criteria, you must decide if the test fails or passes.

You can read the topic Add analysis to see how you add the analysis to a test.

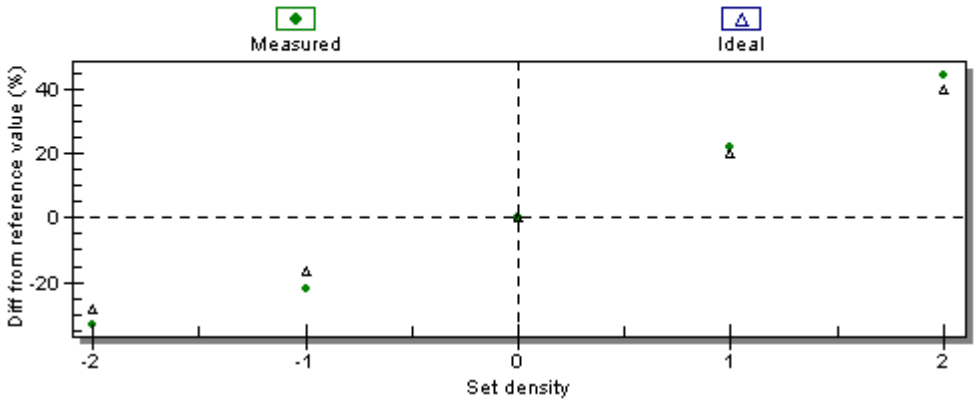
By default the measured exposure or optical density is plotted in a graph and compared to an ideal curve. If you want to include the standard deviation also, you must modify the standard analysis. See topic Modify analysis and Advanced analysis for more information.

Typical AEC density correction test (Exposure)

View / Select	#	Set density	Exposure (mGy)	Diff from ref. val. (%)
▶	1	-2	6,000	-33,3
	2	-1	7,000	-22,2
	3	0	9,000	0,0
	4	+1	11,00	22,2
	5	+2	13,00	44,4

AEC density correction

Result: Pass

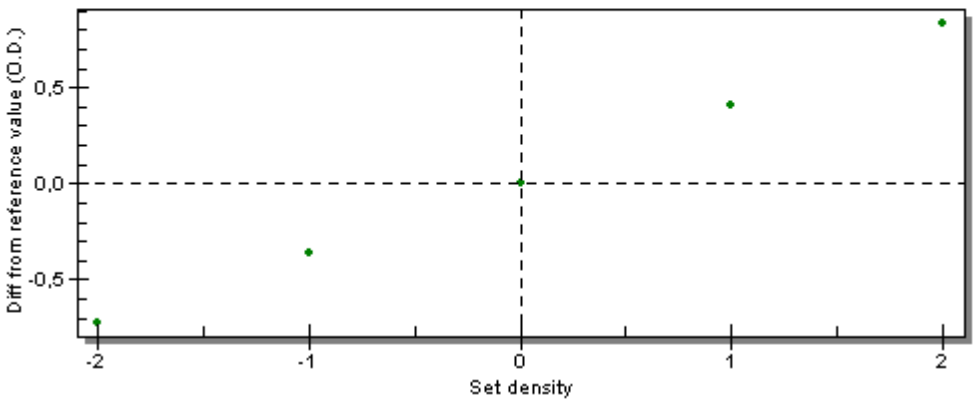


Typical AEC density correction test (O.D.)

View / Select	#	Set density	Meas O.D.	Diff from ref. val (O.D.)
	1	-2	0,36	-0,72
	2	-1	0,72	-0,36
	3	0	1,08	0,00
	4	+1	1,49	0,41
	5	+2	1,91	0,83

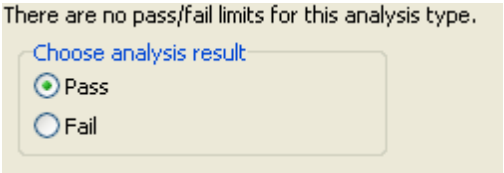
AEC density correction

Result: Pass

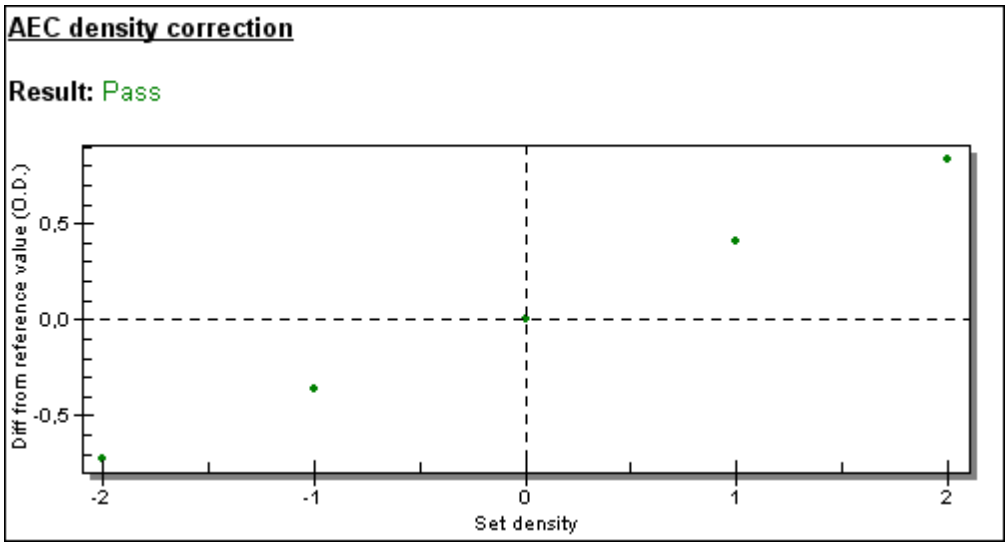


Default pass/fail criteria

There are no pass/fail criteria for this analysis. You must decide this.

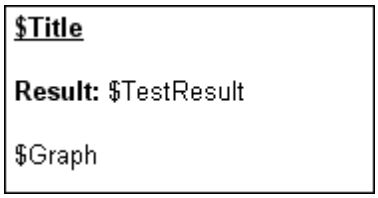


Default result (Exposure)



Result layout and macros

As described in the topic Advanced analysis, it is possible to modify the the layout of the analysis result. The layout is defined by text combined with "macros". When the analysis result is shown, the macros are replaced with the appropriate calculated values, set values and measured values. The default layout of text AEC density correction analysis looks like this:



This text can be modified and more macros can be used to show more calculated results, for example the relative difference. The following macros are available for the AEC density correction analysis:

$Title (Specified title)
$Result (Analysis result)
$TestResult (Pass or fail text, the overall result for the test)
$UnitForDeviation (% or O.D. depending on method used)
$Graph (Graphical representation of results)
$Unit (The current unit (O.D. or used Exposure unit))

Calculations

There are no calculations.

Required columns (or general settings)

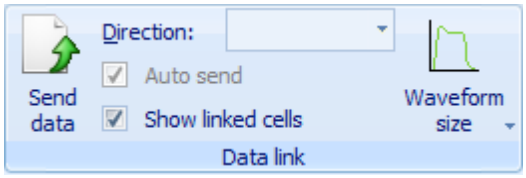
The following columns are required for the AEC density correction analysis:

Parameter	Description
Measured value or Exposure or O.D.	The measured values are used to calculate the difference from mean value, coefficient of variation and standard deviation.
Set density	This is the density setting.

3.3 Data link

The functions you need when you want to send data to Microsoft Excel or OpenOffice Calc are located on the Data link tab of the Ribbon bar. You can select Excel or Calc in the Program options. Functions are divided into two different groups:

Data link



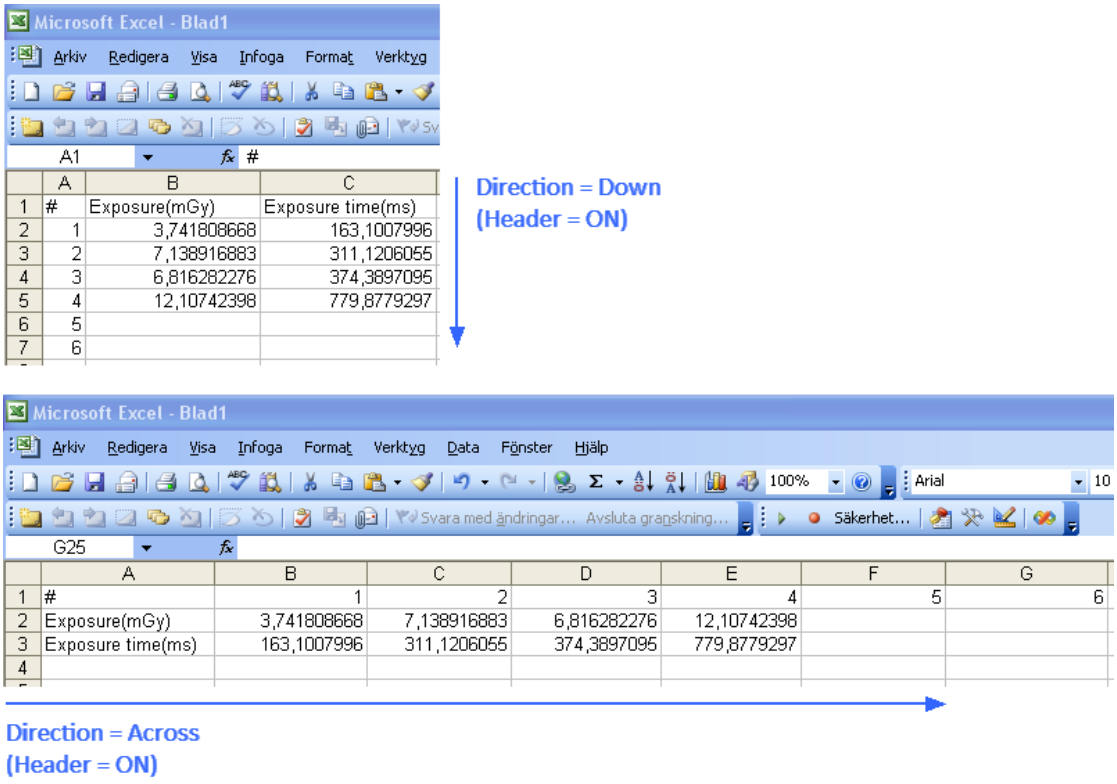
These functions are related to exporting data to a spreadsheet.

Send data - Send data manually to a spreadsheet

You can manually send data to a spreadsheet by using this button. The data will be sent to the spreadsheet according to the currently selected data export mode.

Direction - Manually select direction to fill the spreadsheet (horizontal/vertical)

Data can be sent using the Down or Across direction. This is used only when you are not using direct linking between cells in Ocean and in Microsoft Excel (or OpenOffice Calc).



	A	B	C
1	#	Exposure(mGy)	Exposure time(ms)
2	1	3,741808668	163,1007996
3	2	7,138916883	311,1206055
4	3	6,816282276	374,3897095
5	4	12,10742398	779,8779297
6	5		
7	6		

	A	B	C	D	E	F	G
1	#	1	2	3	4	5	6
2	Exposure(mGy)	3,741808668	7,138916883	6,816282276	12,10742398		
3	Exposure time(ms)	163,1007996	311,1206055	374,3897095	779,8779297		
4							

Click to compress

Auto send - Enable auto send

With auto send on, data is transferred automatically from your meter to the spreadsheet after each exposure. Auto send can be used with all link modes, but it's optional since the data can always be sent by using the "Data send" button.

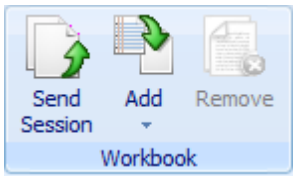
Show linked cells - Enable indication for linked cells

This is only used for cell-to-cell mode to indicate which Ocean cells that are linked to a spreadsheet.

Waveform size - Size of exported waveform graphs

You can select the size for the waveform graphs that are exported to the spreadsheet. Three different sizes are available.

Workbook



These functions are to help you quickly connect or disconnect a workbook to a session or to a real-time display.

Send Session - Send a complete session to a workbook

You can send a complete session to a workbook.

Read more on this in topic Send Session.

Add - "Link" a workbook to current session or real-time display

This button is used to "link" a workbook to a session or a real-time display. There are three ways to

"link" workbooks:

Embed workbook: When you use this type of "link", a copy of the "linked" workbook is stored (embedded) inside the session or real-time display.

NOTE: In this case, Ocean works with the embedded copy of the workbook and the original file is not needed when you use the session template or real-time display template to which the workbook was "linked". Using this function gives users the benefit of never losing the workbook by accident.

Read more on this in topic Associate or embed a workbook.

Associate workbook: When you use this type of "link", it will be established to a user-specified workbook.

NOTE: Once you "linked" a workbook to a session template or a real-time display using the Associate function, that workbook must be available on your computer (or other media such as a CD or flash drive) so Ocean can find it and create the link whenever you use the session template or real-time display to which the workbook was linked. It is, therefore, recommended that you either store your "linked" workbooks in a clearly identified folder on the computer you usually use Ocean with or on other media (such as a CD or flash drive) that is clearly marked and readily accessible when you use Ocean.

Read more on this in topic Associate or embed a workbook.

Free workbook: Use this type "link" when you just want to create a temporary link.

NOTE: In this case the link is not saved when you save the real-time display or the session.

Read more on this in topic Free workbook.

Remove - Delete the link to the workbook

Use this function to delete a link to an associated workbook or remove an embedded workbook.

Read more on this in topic Associate or embed a workbook.

3.3.1 Free workbook

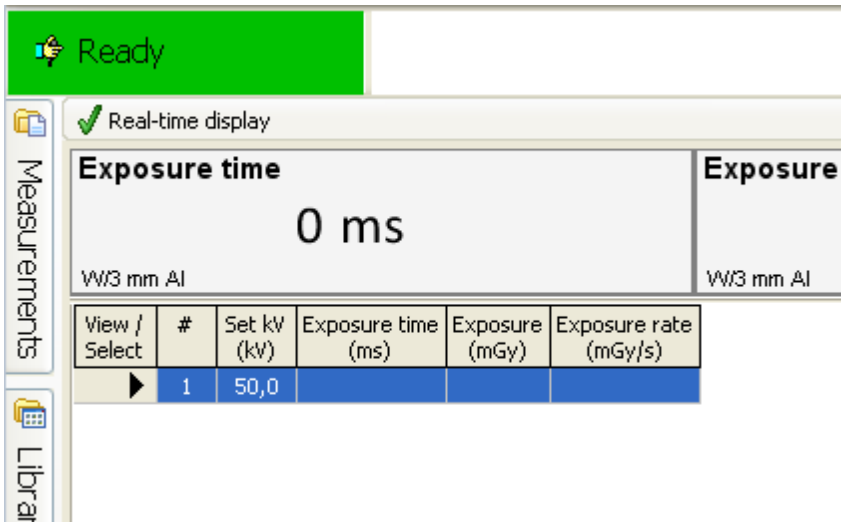
Use a free workbook when you want to transfer exposure data row-by-row quickly and easily to a spreadsheet. When you use this feature, a connection between your Ocean object and the workbook is established while the documents are open. As soon as you save and quit, the connection is closed. It is not "remembered" by the Ocean object as it is if you use an embedded or associated workbook.

For the example below, assume you have the following table in your spreadsheet and you want to fill it with measured data:

	A	B	C	D	E
1					
2					
3					
4		**Set kV**	**Time(ms)**	**Dose (mGy)**	**Dose rate (mGy/s)**
5		**50**			
6		**70**			
7		**90**			
8		**110**			
9					
10					

Click to minimize

1. Create a real-time display with four columns; Set kV, Time, Exposure and Exposure rate.



Click to minimize

2. Go to the Data link page on the Ribbon bar and click on the "Add workbook" button.

3. Select "Free workbook".

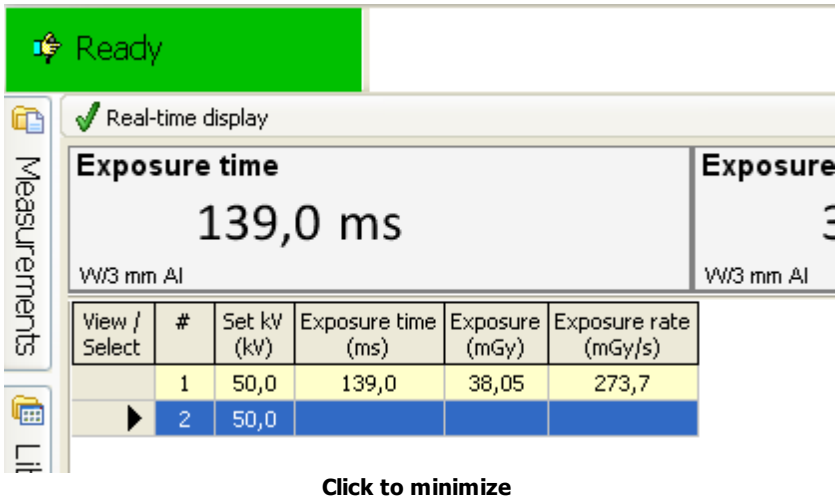
4. I dialogue is activated to help you select an OpenOffice Calc or a Microsoft Excel spreadsheet. For our example, if yo9u have OpenOffice, choose the "Select an Office spreadsheet file" option.

5. Locate the file with the table you want to fill in.

6. Select the upper left cell in the table (in the spreadsheet). You have two options here:

- Place it in the "Set kV" column, the value from Ocean will overwrite the value in the spreadsheet.
- Right-click on the "Set kV" column heading in Ocean and uncheck "Include column in spreadsheet exports". In this case select the first row in the Time column in the spreadsheet.

7. Set the generator and make an exposure.



Click to minimize

8. Measured data is now transferred to the spreadsheet.

	A	B	C	D	E
1					
2					
3					
4		**Set kV**	**Time(ms)**	**Dose (mGy)**	**Dose rate (mGy/s)**
5		**50**	139,0	38,1	273,7
6		**70**			
7		**90**			
8		**110**			
9					
10					

Click to minimize

3.3.2 Associate or embed a workbook

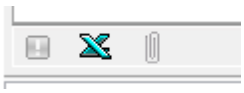
If you purchased Ocean Connect or Professional license, you can associate or embed any Excel or OpenOffice Calc workbook with a session or a real-time display. The spreadsheet can be empty or one that already has pre-defined calculations and other information in it, so all you really want to do is fill in the measurement values.

In times past, you would need to create a template first to make your measurements and then export those measurements to Excel (or Calc). Now, Ocean allows you to automate the process and create a "link" or "association" between the Ocean template and your Excel (or Calc) spreadsheet. It enables you to send all your measurement data to one spreadsheet or, if you prefer, send some of the data to one spreadsheet and other data from the same template to another spreadsheet. The Ocean template and your specified spreadsheet(s) will become a single unit, complementing each other to make data transfer from Ocean to spreadsheet smooth and fast.

Ocean offers two ways to link spreadsheets:

Associate

If you choose this option, your workbook is stored somewhere on your computer, but the workbook location is stored as part of your Ocean template. Once you created this association Ocean will take care of the file for you. When you open your Ocean template, Ocean also opens the associated Excel (or Calc) workbook automatically. When you close your Ocean template, any new work you did will be saved and the Excel (or Calc) workbook will also be closed automatically. A template with an associated workbook will have the "X" Excel symbol appear at the bottom of the grid as shown in the picture below:



NOTE: When you use the association method of linking your workbook to Ocean templates, you must make sure that you don't move the Excel (or Calc) files Ocean is using, because Ocean saves the location of these files inside your template and expects them to be found at the location you originally specified. Also, if you want to share your templates, you must not forget to send along the associated Excel (or Calc) workbook as well. If you for some reason move the associated file and Ocean doesn't find it; you will get an option to browse for a new Excel (or Calc) file. All links you may have will be kept and linked to the new file.

When you remove an association to a workbook, the workbook will remain unchanged since it is only the link to a specific location you are removing from Ocean. You are not removing your workbook from your computer.

Embed

If you choose this option, your workbook will be embedded into your Ocean template and the whole

workbook will become part of your template. A copy of the workbook will be left on your computer but Ocean will use it's own embedded copy and the other copy on your computer will not be updated with new data. When you open your Ocean template, the embedded workbook will be opened as well. Ocean also opens the associated Excel (or Calc) workbook. When you close your Ocean template, any new work you did will be saved and the embedded workbook will be closed as well.

When you embed the workbook, it will always reside inside Ocean and will become a permanent part of the Ocean template until you remove it. If you send an embedded Ocean template to someone, they will automatically get the Excel file. A template with an embedded workbook will have the "X" Excel symbol in a black rectangle appear at the bottom of the grid as shown in the picture below:



When you remove an embedded workbook from a template, the workbook will be deleted. It is permanently removed from the Ocean database. If you want to keep the workbook, follow the procedure below:

1. Open the session or template (when you do this, Ocean will start Excel (or Calc).

2. Use the Excel (or Calc) save function to save the workbook on your computer, then close the session or template (when you do this, a copy of the workbook will be saved in Excel (or Calc).

3. Remove the embedded workbook from the session or template.

It is possible to embed or associate a spreadsheet to a test as well. However, not that you can not use a test "as it is", it must always be part of a session. You can in this way "bring in" a spreadsheet to a session and then link other test to it.

3.3.3 Data link mode

There are three different ways to send data to Excel (or Calc):

- Dump all data including column headers into a spreadsheet
- Send data row-by-row for each new exposure (called Free workbook)
- Connect cells in your Ocean template to cells in your spreadsheet (called Cell-to-cell mode)

Ocean's Cell-to-cell mode is very powerful and makes it possible for you to take full control of how and where the measured data is placed in your spreadsheet. You can also choose if the measured data should be sent to the spreadsheet automatically as you make each exposure or manually when you click on the "Send data" button.

3.3.4 Copy and paste

You can use copy and paste to move data from Oceans grid into Excel or Calc:

1. Select the cells you want to copy.

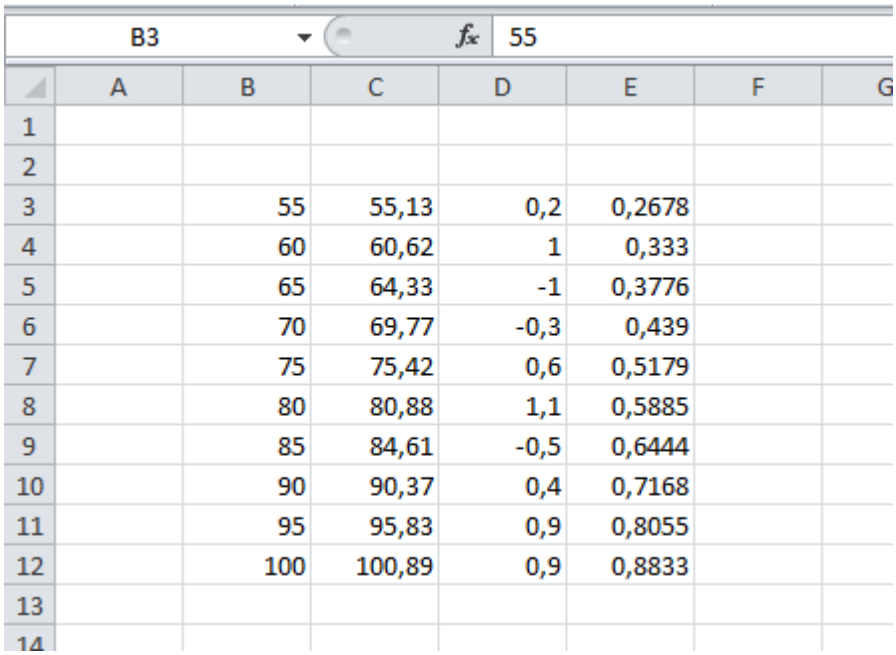
View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)
	1	55	55,13	0,2	0,2678	112,9
	2	60	60,62	1,0	0,3330	98,27
	3	65	64,33	-1,0	0,3776	98,27
	4	70	69,77	-0,3	0,4390	98,77
	5	75	75,42	0,6	0,5179	99,27
	6	80	80,88	1,1	0,5885	98,77
	7	85	84,61	-0,5	0,6444	99,28
	8	90	90,37	0,4	0,7168	98,77
	9	95	95,83	0,9	0,8055	98,77
	10	100	100,89	0,9	0,8833	98,78
	11	105	104,37	-0,6	0,9383	98,77
	12	110	109,57	-0,4	1,022	98,78
	13	115	115,14	0,1	1,115	98,78
	14	120	120,43	0,4	1,195	98,77

Click to compress

2. Type Ctrl+c and open the document you want to copy to, for example Excel.

3. Select a cell.

4. Type Ctrl+v to paste the data into Excel.



	A	B	C	D	E	F	G
1							
2							
3		55	55,13	0,2	0,2678		
4		60	60,62	1	0,333		
5		65	64,33	-1	0,3776		
6		70	69,77	-0,3	0,439		
7		75	75,42	0,6	0,5179		
8		80	80,88	1,1	0,5885		
9		85	84,61	-0,5	0,6444		
10		90	90,37	0,4	0,7168		
11		95	95,83	0,9	0,8055		
12		100	100,89	0,9	0,8833		
13							
14							

Click to compress

3.3.5 Send data to Excel (or Calc)

You can send data to Excel or Calc in different ways:

- send current test, checklist or real-time display (read more on this in topic Send test, checklist or real-time display)
- send current session to a workbook (Excel or Calc) (read more on this in topic Send a session)
- send individual cell content to a specific cell in Excel or Calc (read more on this in topic Link a session to Excel or Calc)

You can send contents in the grid and waveforms.

3.3.5.1 Send a test, checklist or real-time display

The Send data function is used when you want to do a data dump of the current test to a workbook without any special need to control where the data goes. For this example, let's assume that you have the following data in your Ocean grid and you want to dump this data into a workbook:

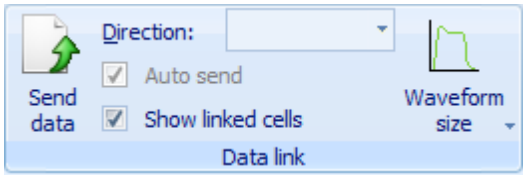
Set mAs (mAs)	Set kV (kV)
2,5	80

View / Select	#	Set Added filtr. (mm Al)	Exposure (mGy)
	1	0,0	0,3006
	2	1,0	0,2341
	3	2,1	0,1847
	4	3,0	0,1602
	5	4,0	0,1322

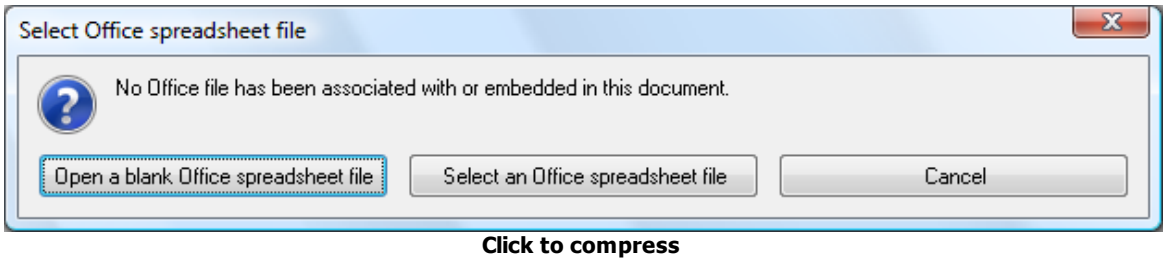
Click to compress

1. Go to the Data link page on the ribbon bar.

2. Click the "Send data" button.



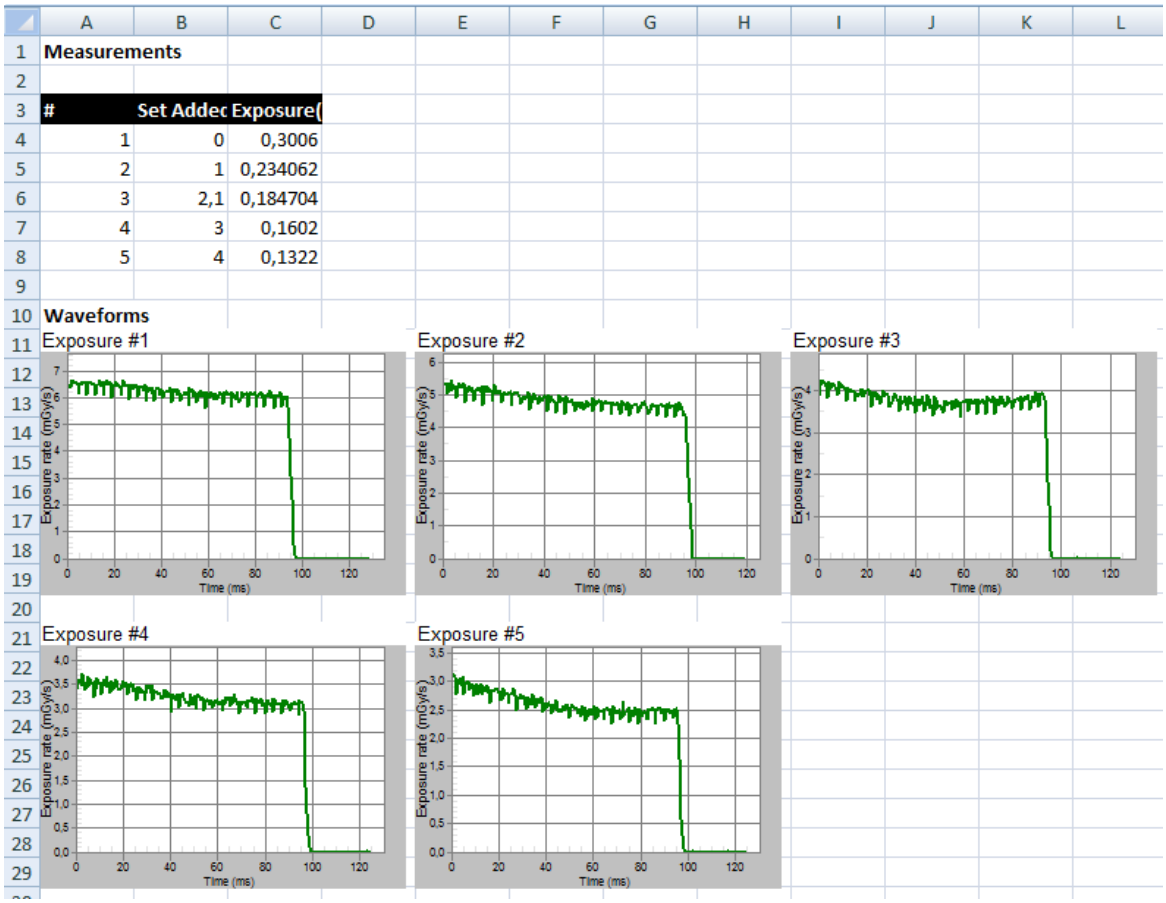
3. A dialogue will appear giving you two choices. You will be asked to choose between opening a blank spreadsheet (this opens a new workbook) or open a specific spreadsheet file (this will allow you to browse your way to the correct file on your computer and open it). You must select one to continue:


Select Office spreadsheet file
No Office file has been associated with or embedded in this document.
Open a blank Office spreadsheet file
Select an Office spreadsheet file
Cancel

Click to compress

For our example, we will select in "Open a blank Office spreadsheet file".

4. A new spreadsheet is opened and the data is dumped into it. Your spreadsheet should look like the picture below after the dump. The data is dumped in the order it appears in the Ocean grid. Column #1 in your spreadsheet will be what is column #1 in the Ocean grid, #2 will be #2, etc. and row #1 in your spreadsheet will be the column headings, and the data will begin at row #2.



	A	B	C
1	Measurements		
2			
3	#	Set Addec	Exposure(
4	1	0	0,3006
5	2	1	0,234062
6	3	2,1	0,184704
7	4	3	0,1602
8	5	4	0,1322
9			
10	Waveforms		

Click to compress

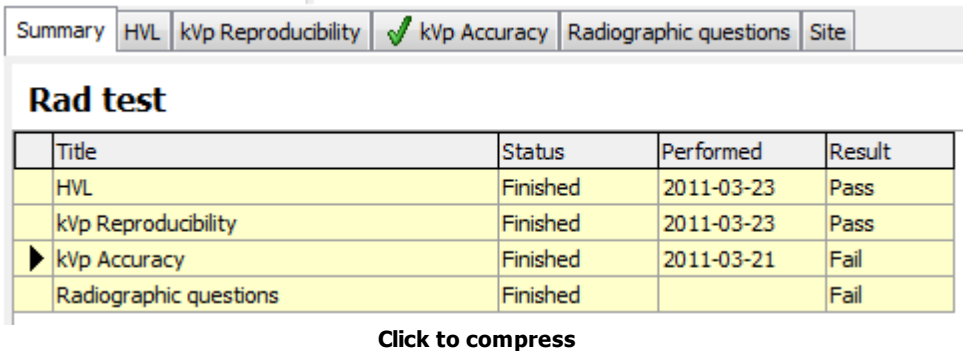
Waveforms, i measured, are placed after the measured data. Each waveform is tagged with the exposure #.

5. Once the dump is complete, you can save your new workbook.

Every time you click on "Send data" all data from the Ocean grid will be dumped into Excel (or Calc) beginning at the selected cell. In the example above, we started with a new workbook, so the data will be dumped beginning at cell A1.

3.3.5.2 Send a session

The Send Session function is used when you want to do a data dump from a session to a workbook without any special need to control where the data goes. For this example, let's assume that you have an active session.



Summary | HVL | kVp Reproducibility | kVp Accuracy | Radiographic questions | Site

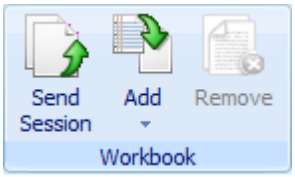
Rad test

	Title	Status	Performed	Result
	HVL	Finished	2011-03-23	Pass
	kVp Reproducibility	Finished	2011-03-23	Pass
▶	kVp Accuracy	Finished	2011-03-21	Fail
	Radiographic questions	Finished		Fail

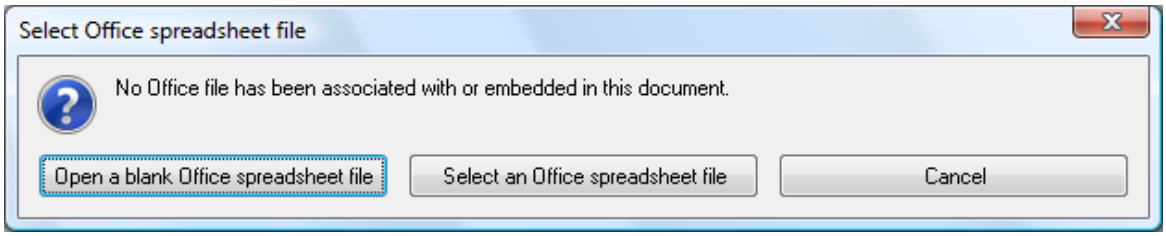
Click to compress

1. Go to the Data link page on the ribbon bar.

2. Click the "Send Session" button.



3. A dialogue will appear giving you two choices. You will be asked to choose between opening a blank spreadsheet (this opens a new workbook) or open a specific spreadsheet file (this will allow you to browse your way to the correct file on your computer and open it). You must select one to continue:


Select Office spreadsheet file
No Office file has been associated with or embedded in this document.
Open a blank Office spreadsheet file
Select an Office spreadsheet file
Cancel

Click to compress

For our example, we will select in "Open a blank Office spreadsheet file".

4. A new workbook is opened and the data is dumped into it. The first spreadsheet will show the site information and the second one all tests and checklists. The data, including waveforms, are dumped in the order it appears in the Ocean.

5. Once the dump is complete, you can save your new workbook.

3.3.6 Link a session to Excel (or Calc)

This topic will describe how you can connect a workbook to a session (or real-time display) and how you can link certain cells in the Ocean grid to certain cells in Excel (or OpenOffice Calc). You can also link a waveform to a certain cell in the workbook.

Connect a workbook to a session or real-time display

You can connect a spreadsheet two different ways (associate or embed).

1. Select the session or real-time display to which you wish to connect a workbook and open it.

2. Go to the Data link page on the ribbon bar and click the Add function.

3. Choose either Embed or Associate link, depending on what you want. You can read about the difference here...

4. A browse window will open so you can browse your way to the file you want to link. Select the file you want.

5. The workbook is not connected until you save the session or real-time display. Here is a brief description of what the difference is between Associated link and Embedded link.

Associated: Ocean now knows where the workbook file is and will open it when needed (and close it when not needed). **You must make sure this workbook is never moved after it is connected to an Ocean template**.

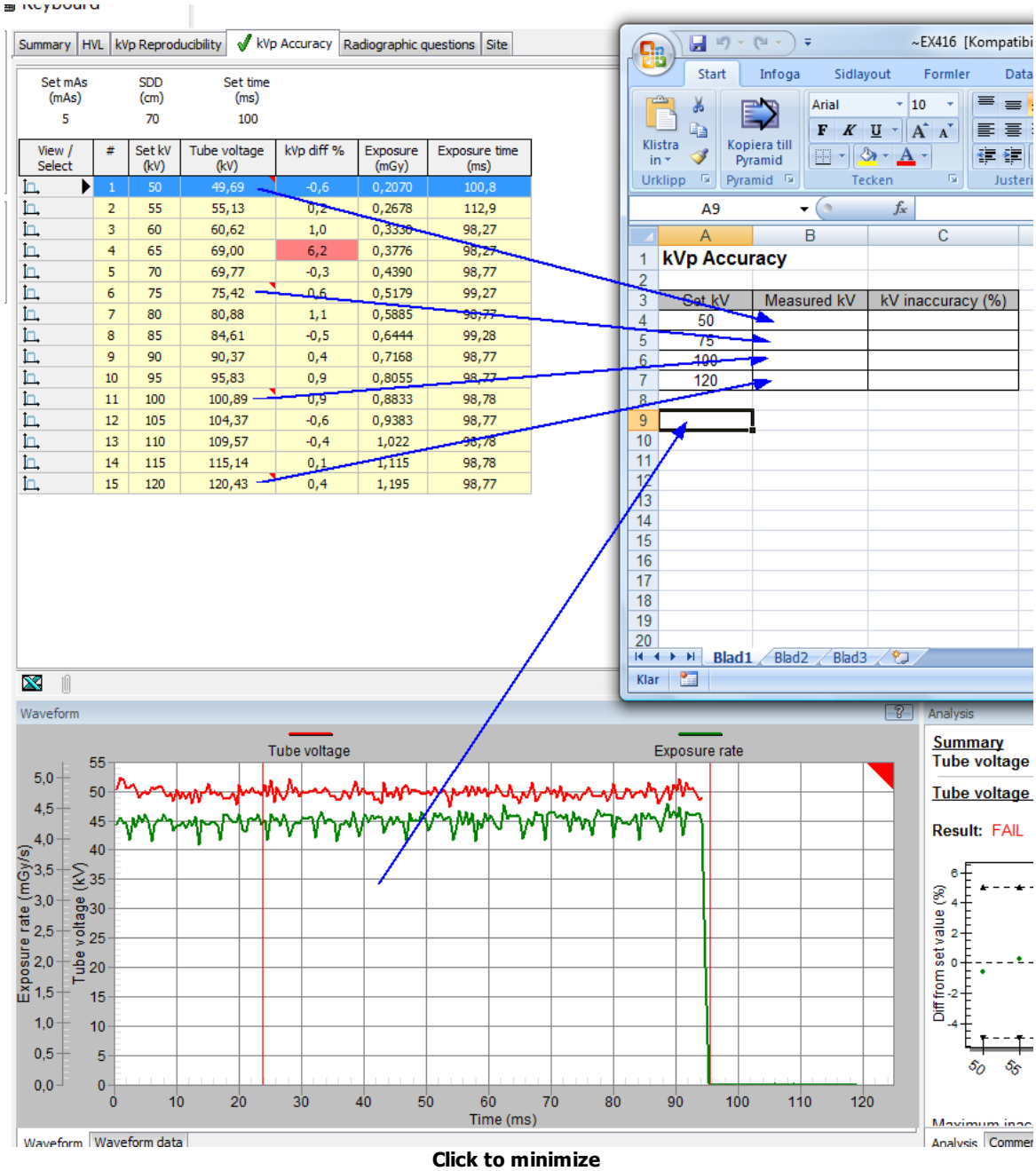
Embedded: Ocean will take the workbook and make it a permanent part of the session or real-time display until you wish to remove it manually. The workbook file you used to make the connection to Ocean will be left as it is, but will not be needed in the future, and will not be updated automatically after each use. The only copy Ocean will use once the link is made is its own internal copy that is part of the session. Ocean will keep track of the workbook and open it whenever needed and close it when you close the session or real-time display.

6. Click save (in Ocean) to save the session or real-time display.

Now the workbook and the Ocean session or real-time display are permanently connected to each other.

Create link between cells in Excel (or Calc) and cells in an Ocean template

The most powerful and effective way to use Ocean with Excel (or Calc) is to use what is called "Cell-to-cell" mode. The following example shows the principle of using "cell-to-cell" linking. For the example, we will assume that you have a session with a test template and an Excel workbook with a spreadsheet as sown in the picture below:



Click to minimize

The arrows indicates where you want the Ocean data to go in your spreadsheet.

1. Follow the steps outlined above to link a workbook to a template if you don't have one linked yet. We will assume, for this example, that there is a workbook associated or embedded into our template already.

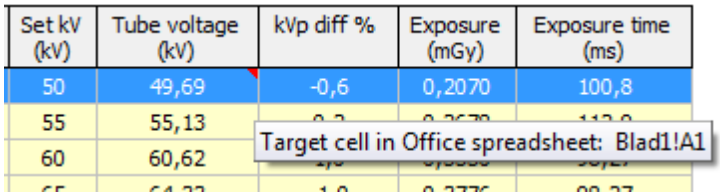
2. Make sure that the test (or checklist) you are going to link from is selected and opened.

3. Select the first cell in Excel:

	A	B	C
1	kVp Accuracy		
2			
3	Set kV	Measured kV	kV inaccuracy (%)
4	50		
5	75		
6	100		
7	120		
8			

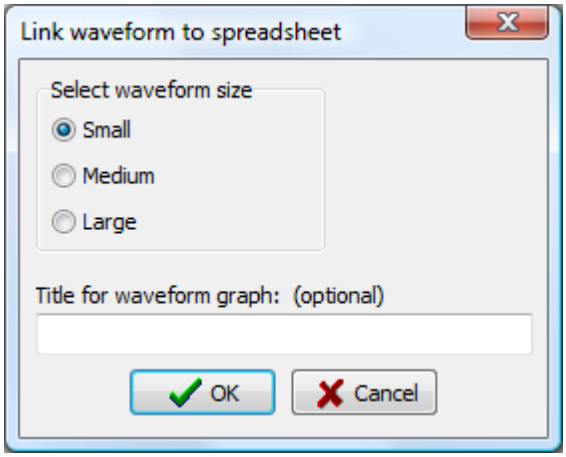
3. Now go to Ocean and right-click the cell you want to link. Select "Link selected cell(s) to Office spreadsheet" from the menu.

4. A red arrow will appear to indicate that this cell is linked. If you hover the cursor over the cell, a hint will tell you where this cell is linked to. It is possible to link a block of cells simultaneously, see how to do this here...



5. You can also link the waveform that "belong" to the exposure. First go back to the spreadsheet and select a cell where you want the upper left corner of the waveform graph to appear.

6. Now go back to Ocean and right-click on the waveform panel. From the menu select Link waveform to spreadsheet. A dialogue is shown:



Click OK.

7. A link is now created between the cell in Excel and the waveform. This is indicated by a red triangle in the upper right corner of the waveform graph.

8. Repeat the above step #3 and #4 to link the other three cells (in this example are waveforms for additional rows not included). Once the links are done, your Ocean grid should look like this:

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)
	1	50	49,69	-0,6	0,2070	100,8
	2	55	55,13	0,2	0,2678	112,9
	3	60	60,62	1,0	0,3330	98,27
▶	4	65	64,33	-1,0	0,3776	98,27
	5	70	69,77	-0,3	0,4390	98,77
	6	75	75,42	0,6	0,5179	99,27
	7	80	80,88	1,1	0,5885	98,77
	8	85	84,61	-0,5	0,6444	99,28
	9	90	90,37	0,4	0,7168	98,77
	10	95	95,83	0,9	0,8055	98,77
	11	100	100,89	0,9	0,8833	98,78
	12	105	104,37	-0,6	0,9383	98,77
	13	110	109,57	-0,4	1,022	98,78
	14	115	115,14	0,1	1,115	98,78
	15	120	120,43	0,4	1,195	98,77

Click to minimize

6. Click save to save what you have done.

You can choose to send the data to the workbook either manually each time you click "Send data" or automatically after each exposure. Check "Auto send" if you want to send it automatically after each exposure.

Link a block of cells

It is possible to link an entire block of cells simultaneously. To do this, follow the steps described below:

1. Select the cell in the spreadsheet that represents the upper left corner of the block you want to create links for.

2. Switch to Ocean. Click (select) the upper left cell in the block you want to create links for.

(kV)	(kV)	
50	49,69	-0,6
55	55,13	0,2
60	60,62	1,0
65	64,33	-1,0
70	69,77	-0,3

3. Hold down the left mouse button and move the mouse pointer to the lower right corner. The selected cells are marked. You can also hold down the Shift key and click on the cell in the lower right corner of the block.

4. The selected cells are now highlighted dark blue (see picture below):

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)
▶	1	50	49,69	-0,6	0,2070	100,8
	2	55	55,13	0,2	0,2678	112,9
	3	60	60,62	1,0	0,3330	98,27
	4	65	64,33	-1,0	0,3776	98,27
	5	70	69,77	-0,3	0,4390	98,77
	6	75	75,42	0,6	0,5179	99,27
	7	80	80,88	1,1	0,5885	98,77
	8	85	84,61	-0,5	0,6444	99,28
	9	90	90,37	0,4	0,7168	98,77
	10	95	95,83	0,9	0,8055	98,77
	11	100	100,89	0,9	0,8833	98,78
	12	105	104,37	-0,6	0,9383	98,77
	13	110	109,57	-0,4	1,022	98,78
	14	115	115,14	0,1	1,115	98,78
	15	120	120,43	0,4	1,195	98,77

Click to minimize

5. Make sure that Direction, Down or Across, is set in the way you want.

6. Right-click anywhere on the selected block to get a menu. From the menu select the "Link selected cell(s) to Office spreadsheet..." option.

7. All the cells are now linked to the spreadsheet.

View / Select	#	Set kV (kV)	Tube voltage (kV)	kVp diff %	Exposure (mGy)	Exposure time (ms)
▶	1	50	49,69	-0,6	0,2070	100,8
	2	55	55,13	0,2	0,2678	112,9
	3	60	60,62	1,0	0,3330	98,27
	4	65	64,33	-1,0	0,3776	98,27
	5	70	69,77	-0,3	0,4390	98,77
	6	75	75,42	0,6	0,5179	99,27
	7	80	80,88	1,1	0,5885	98,77
	8	85	84,61	-0,5	0,6444	99,28
	9	90	90,37	0,4	0,7168	98,77
	10	95	95,83	0,9	0,8055	98,77
	11	100	100,89	0,9	0,8833	98,78
	12	105	104,37	-0,6	0,9383	98,77
	13	110	109,57	-0,4	1,022	98,78
	14	115	115,14	0,1	1,115	98,78
	15	120	120,43	0,4	1,195	98,77

Click to minimize

Links and real-time displays with "Auto new row" enabled

If you are using the real-time display and have Auto new row enabled, a new row is created for each exposure. The new row is a copy of the previous row except for the links. To avoid overwriting the data in the workbook, the links for the new row are automatically pointed to the next row in the workbook. The column pointers are kept.

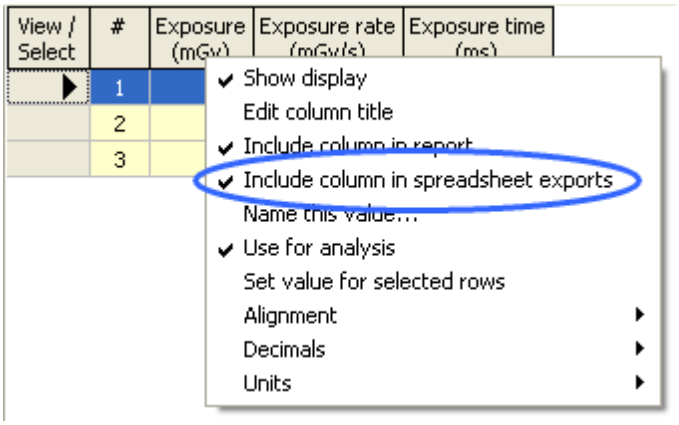
3.3.6.1 Exchange a linked or embedded workbook

In some situations you may want to exchange the work book you have embedded or associated and at the same time keep all the links you have. This can be done just by embedding or associating the new workbook without deleting the existing one first. A dialogue will be shown and you must confirm that you want to load a new workbook.

3.3.7 Exclude a column

You can exclude a column from data export if you want:

1. Right-click on the column heading.
2. Uncheck "Include column in spreadsheet export".



No data from this column is sent to the spreadsheet.

When using Send data button or Free workbook to dump data to the spreadsheet

The column is totally ignored and no space will be reserved for this column in the spreadsheet.

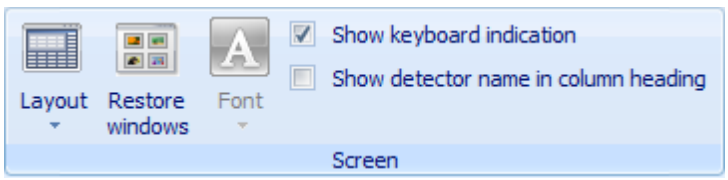
When using linked cells

Links in this column will be ignored and no data will be sent to the spreadsheet.

3.4 Appearance

The controls customize the Main screen layout (your workspace) are found on the Appearance tab of the Ribbon bar. There are screen layout functions, display layout functions and waveform appearance functions available on this tab. Each group of functions is discussed separately below.

Screen



These functions are related to the Main screen layout and appearance.

Layout - Change the layout for the workspace

This button is used to toggle between the three different pre-defined layout choices Ocean offers.

You can also arrange the screen layout manually if none of the three layout choices are to your liking. Read more screen layout in topic Screen layout.

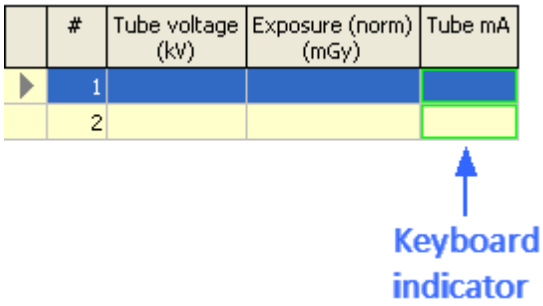
Restore windows - Restore windows

This button is used to restore the default screen layout Screen layout.

Font - Select main font size

Font size selection is not available in this version of Ocean.

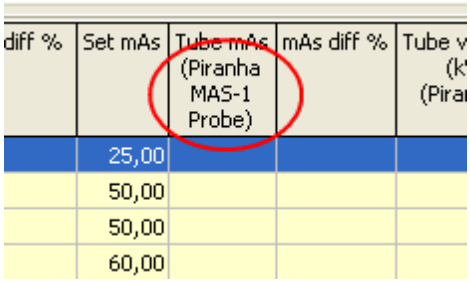
Show keyboard indicator - Indicates that a column needs manual keyboard input



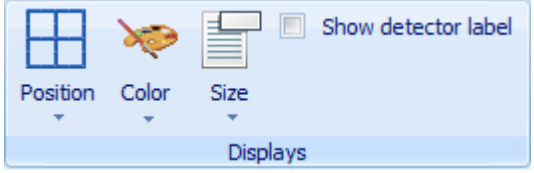
When you use Ocean without a Piranha or Barracuda, or if you don't have a certain detector for the job, you have the option to use this function to mark columns that will need to have values entered into them manually. The special columns requiring input from you via the keyboard are marked with a green outline as you see on the above picture.

Show detector name in column heading - Show the detector name in the column heading

This checkbox is used to show or hide the detector name in the column heading:



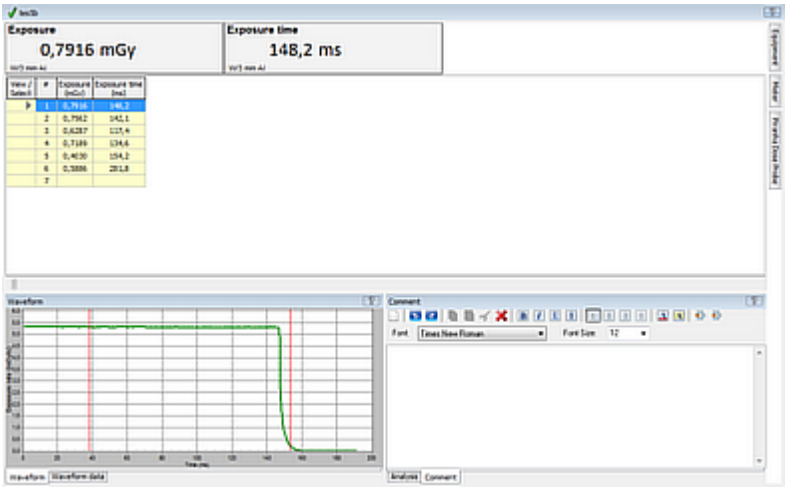
Displays



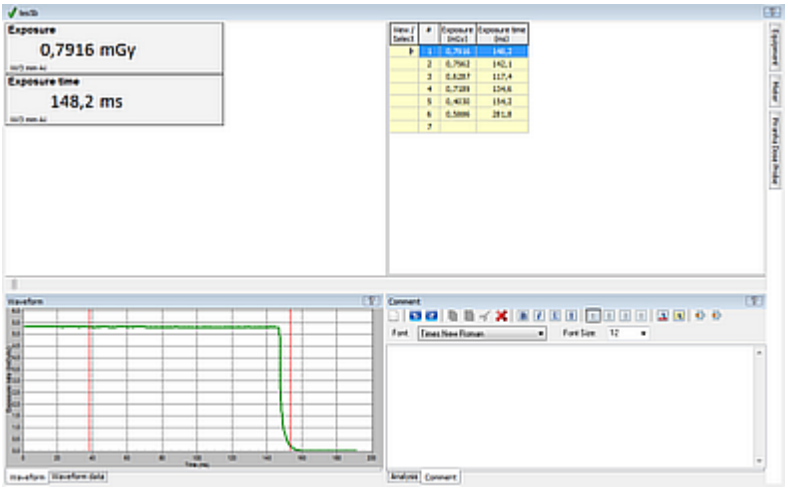
These are the functions you will use to connect or disconnect a workbook to a session or to a real-time display.

Position - Select position for the displays

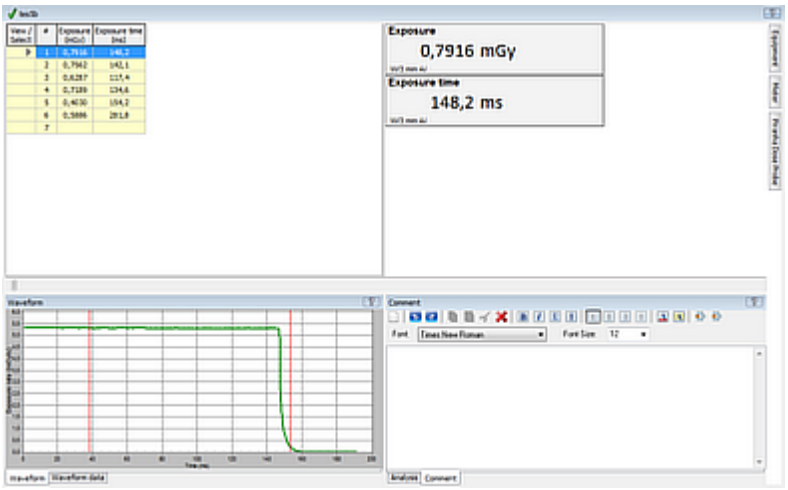
Ocean provides three options, Left, Right or Center for display positioning.



Top



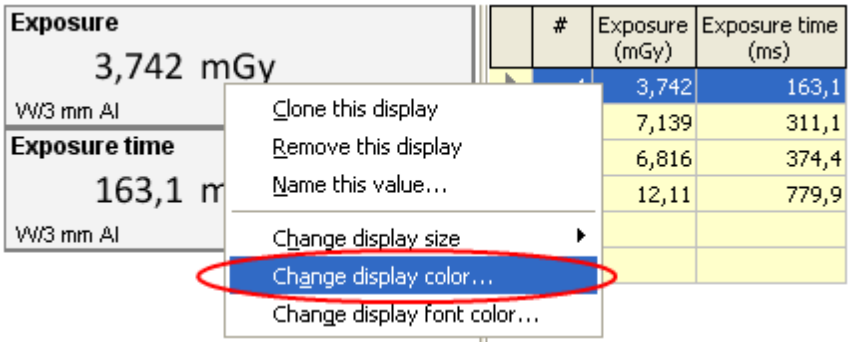
Left



Right

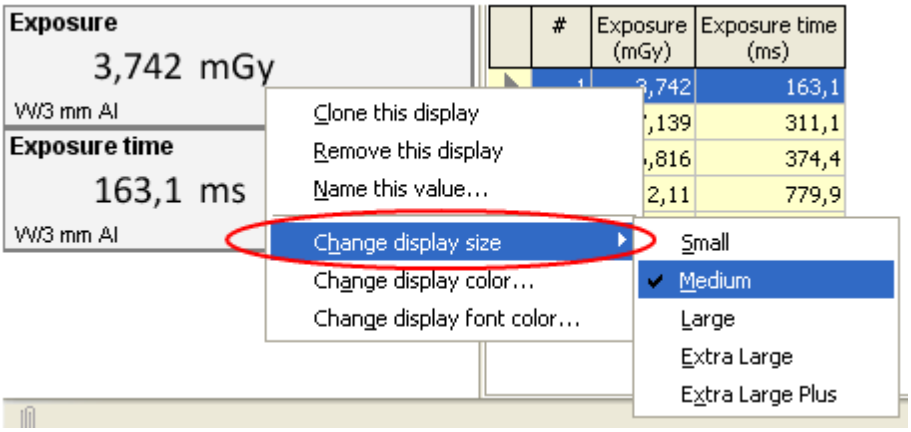
Color - Select color for the displays

You can change background and font color of the displays by clicking on this button. Any changes you make here will affect all of displays. However, if you want each of your displays to have a different font color, you can do that by right-clicking on each display and choose the change color option.

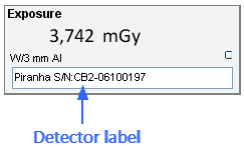


Size - Select size for the displays

You can change the font size of the displays by clicking on this button. Any changes you make here will affect all of displays. However, if you want each of your displays to have a font size, you can do that by right-clicking on each display and choose the change display font size option.

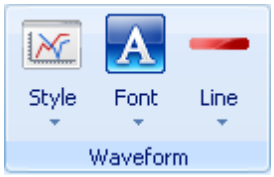


Show detector label - Show detector name/serial number



When you are using several detectors at the same time, it would be very useful in some cases to see which display is showing readings from which detector. If you check this box, the detector information will be shown in the displays.

Waveform



These functions are related to the export feature of Ocean.

Style - Change the style of the waveform graph

There are three pre-defined styles of waveform graphs to choose from: Normal, Paper and Scientific.

Font - Select the font size for the waveform graph

There are three possible sizes for the text in the waveform graph: Small, Medium and Large.

Line - Select the line width for the waveform plot

There are three possible line widths for waveform plotting: "Thin", "Normal" and "Thick".

3.4.1 Screen layout

There are five different pre-defined screen layouts to chose from. When you use these layouts, Ocean always tries to fit the contents the best way possible on your computer's screen size. If you select "None", Ocean loads the template exactly as it is saved without taking the actual screen size into account.

Standard: this is the standard default layout selected when you design something from scratch.

Netbook: this is a layout suitable for the smaller screen size of netbooks.

Pages: this is a layout suitable for very small screen sizes.

Layout 1 and **Layout 2**: these are two screen layouts, suitable for larger screen sizes.

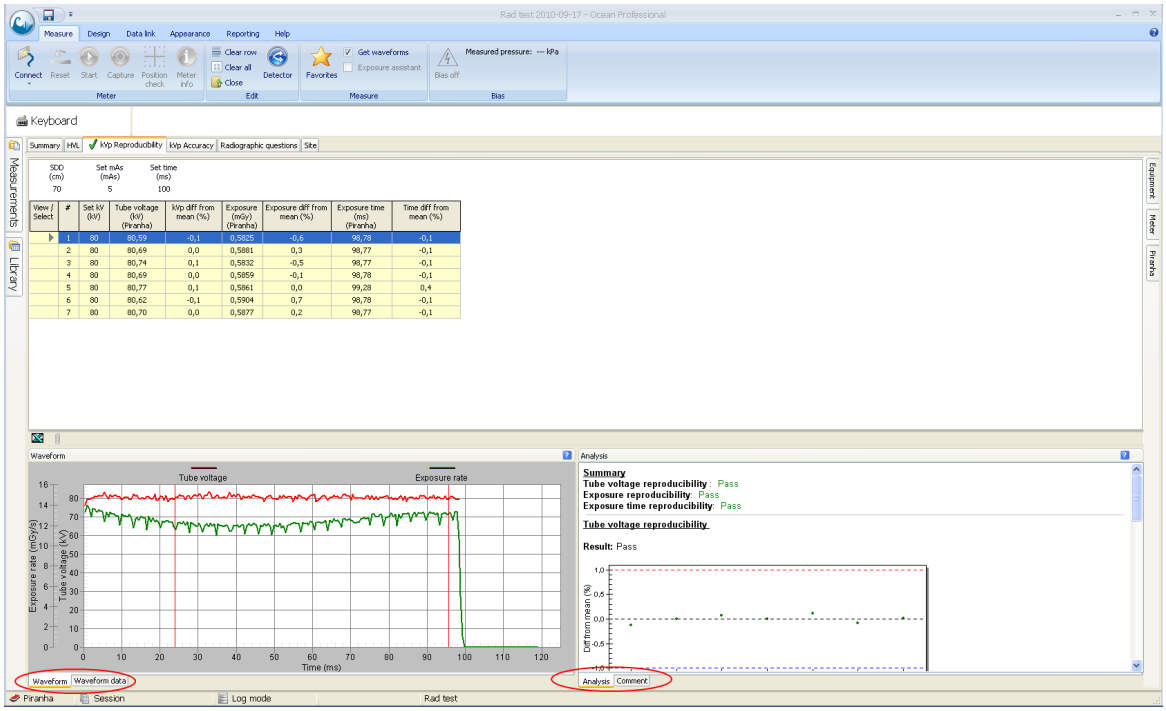
None: select this if you don't want Ocean to auto adjust the layout according to the screen size.

Define your own screen appearance

We have added the ability to create your own custom screen appearance. Each of the windows can be "undocked" and then "docked" in a different place to create a customized screen layout. You can also change the size of each window to make the ones you don't view often smaller and create more room for the windows you use more frequently.

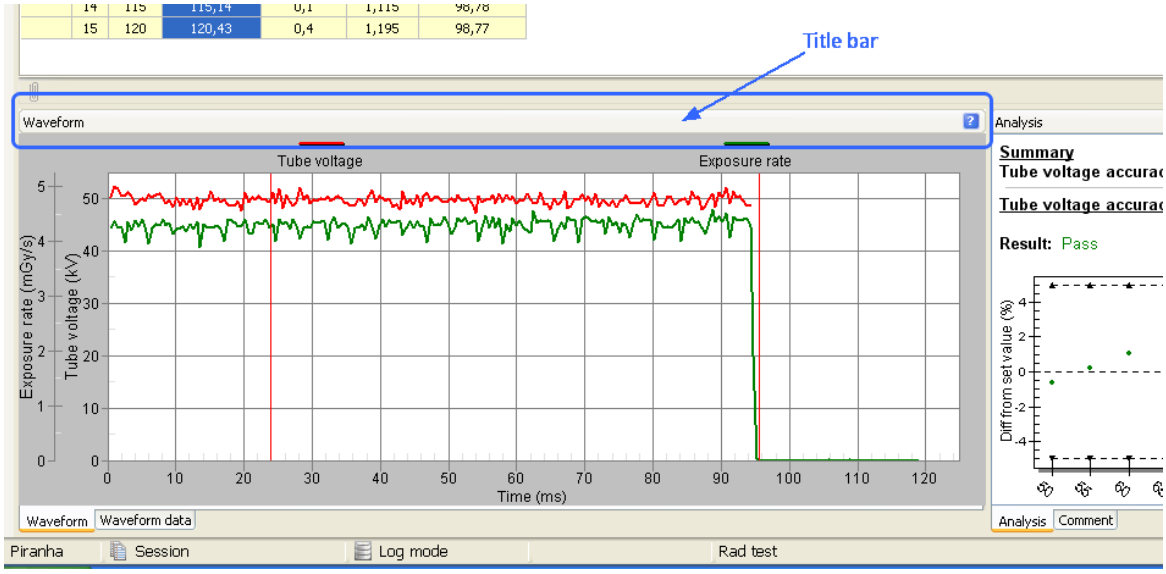
In the following example, we will show you how to create your own new screen appearance. Before we begin, select the layout "None" so that when we are finished with the example, the new screen appearance is preserved when you save and reload your test or real-time display.

The picture below shows the Standard layout. The features of this layout are one large window at the top showing the measurement grid with two smaller ones below it showing the waveform and the analysis and comments.



Click to compress

In the standard view you have four tabs at the bottom of the screen with the window names. Waveform, and Waveform data on the left and Analysis and Comment on the right bottom of the screen. You can organize these windows any way you like by undocking it from its current position and docking it to a new position. You can undock a window by double-clicking on the title bar and then grabbing undocked window and dragging it to a new position. Another way to undock a window is by simple drag-and-drop.



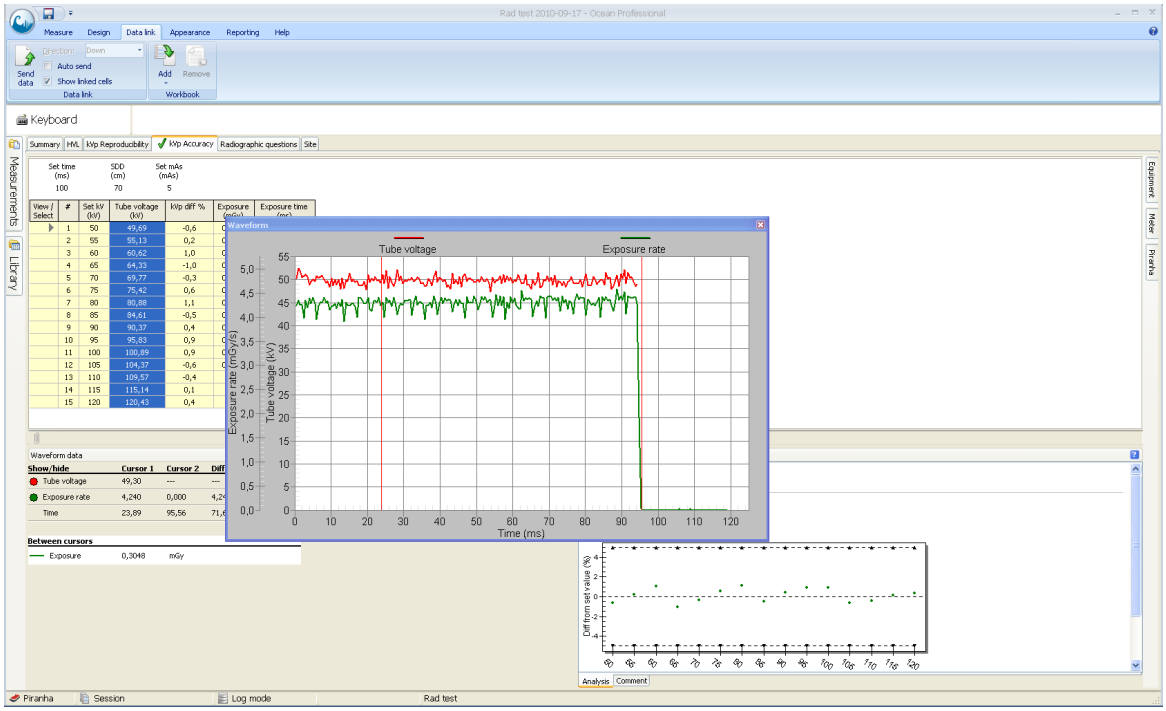
Click to compress

Double-click

For this example, let's undock the Waveform window using the double-click method of undocking.

1. Make sure the Waveform window is on the top by clicking on it's name.

2. To undock the Waveform window, position your cursor anywhere on the title bar of the window, then double-click your mouse. As you see on the picture below, the Waveform window is now moved to the center of the screen undocked.



Click to compress

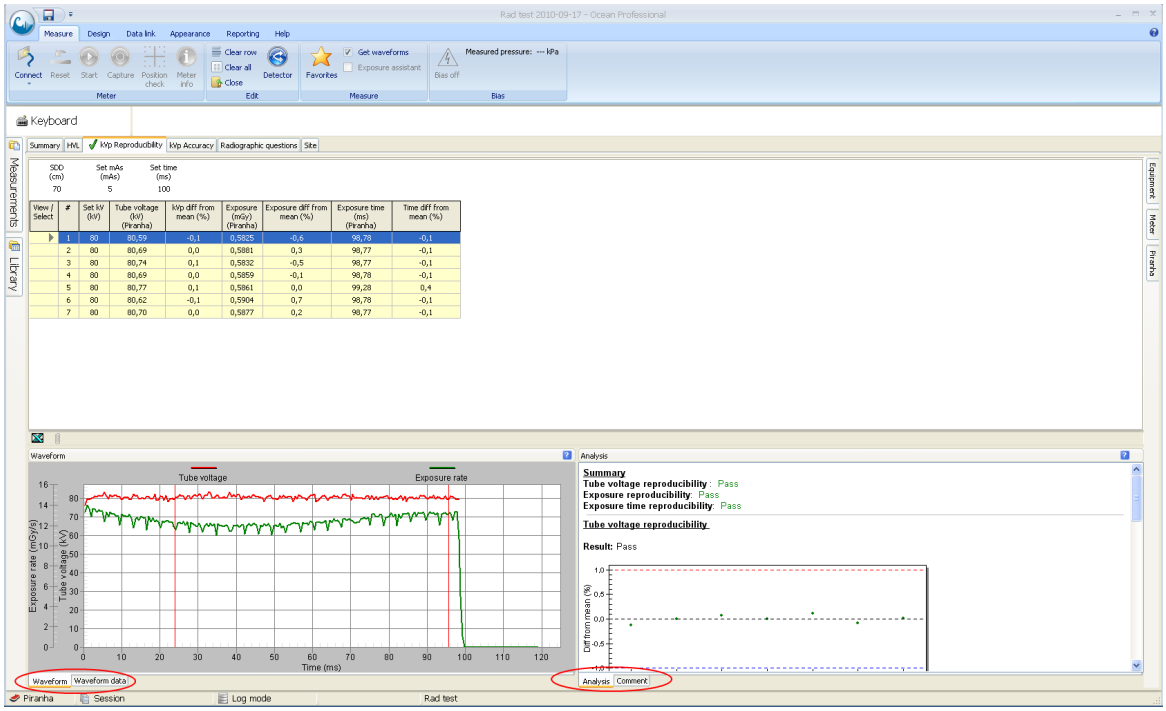
4. To dock the window again back to its original position, double-click on the title bar and the window will pop back to where it came from.

If you wish to dock the window in a different position than where it came from, just follow steps 1-3 as described above. Once the window is undocked, grab it. As soon as you grabbed the window, you will see a number of arrows on your screen. While you still hold on to the window, hover your mouse over one of the arrows and it will show you what the new window position will be if you were to release the window at that particular spot. When you found the right place for the window, just release it and the window will dock automatically to the new position.

NOTE: It is not recommended to keep windows undocked and save templates in that way. Undocked windows may be hidden behind other windows and it may be difficult to know where an undocked window really belongs.

Use drag-and-drop to dock windows

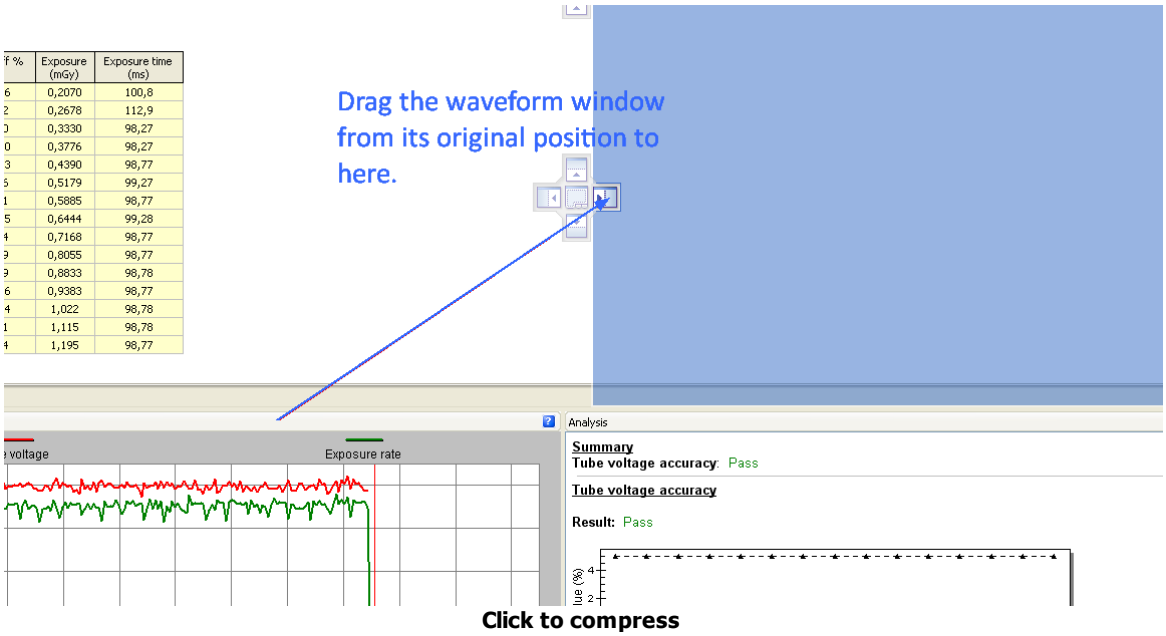
For this example, let's undock the Waveform window using the drag-and-drop method of undocking, move it to the right of the grid and docking it there as the new position. For this exercise, we will use the standard screen layout (see the picture below).



Click to compress

1. Make sure the Waveform window is on the top by clicking on it's name.

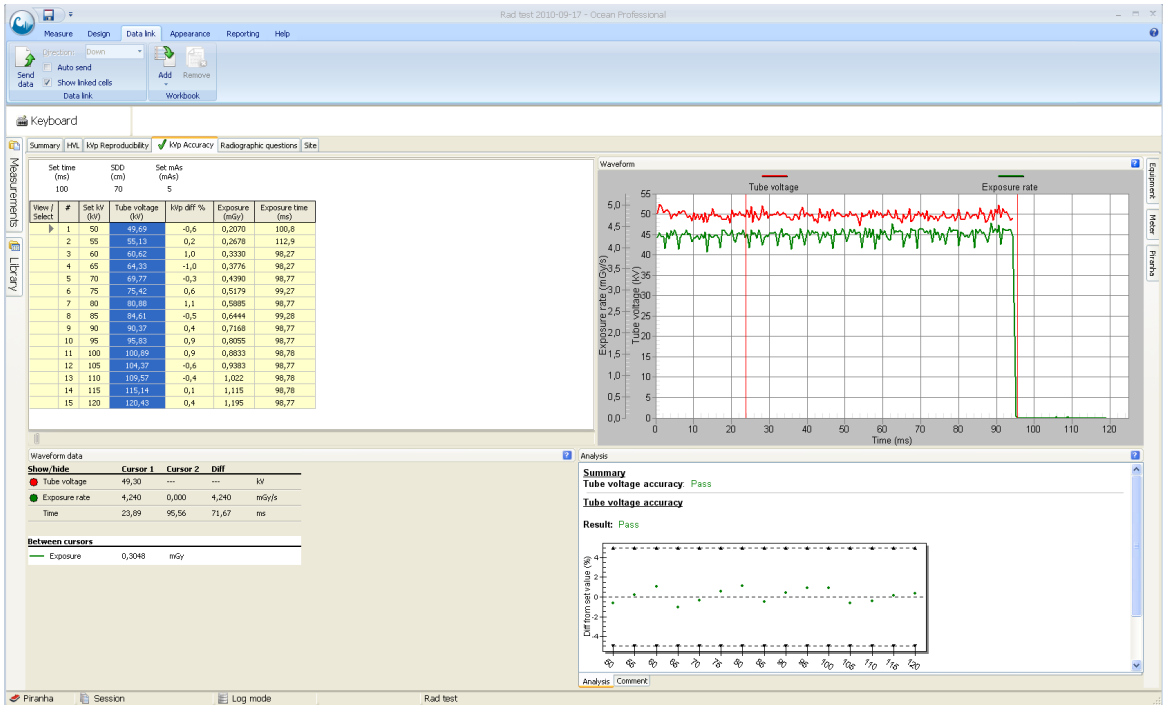
2. To undock the Waveform window, hover your cursor anywhere on the window's title bar and grab it. As you see on the picture below, a dark blue rectangle appears representing the window you wish to move and the arrows appear immediately on the screen.



Click to compress

3. Hover your cursor to the right arrow on the grid while still holding your mouse button down. As you see on the picture above, the dark blue rectangle moved to the right of the grid indicating the new position of the window we want to move.

4. Release the mouse button to drop the window in its new position. Your new screen appearance should now look like the picture below.



Click to compress

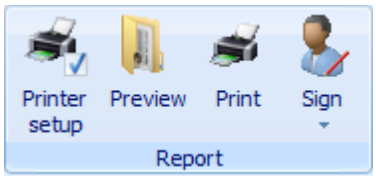
If you save now, the new screen layout is saved and will be the default screen layout the next time you open Ocean.

NOTE: If your templates are going to be used by different people using computers with different screen sizes, it is recommended that you always save your templates with one of Ocean's predefined screen layouts.

3.5 Reporting

The functions for creating and editing reports as well as print the reports are found on the Reporting tab of the Ribbon Bar. a report or print out are found on the Ribbon Reporting tab. The report control functions are divided into Report functions and Setup functions and each group is described below:

Report



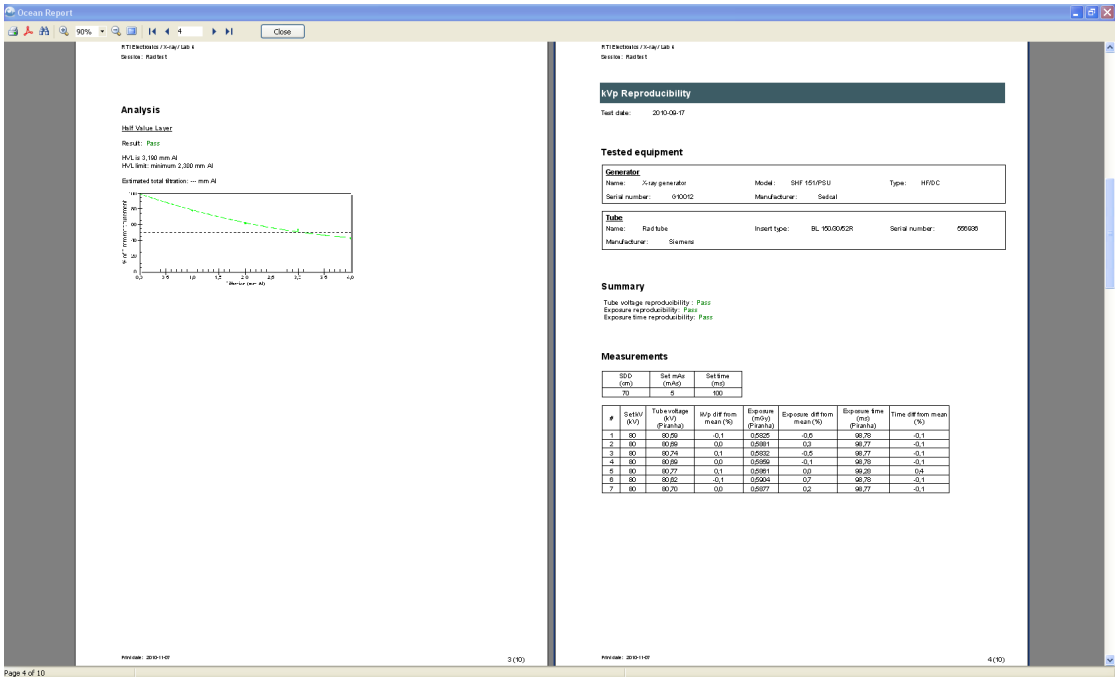
These are the functions you will use to generate a printed report.

Printer setup - Opens the printer setup dialogue

Click here to open the printer set up dialogue.

Preview - Preview the report on the screen

This is a print preview function that allows you to see what is in your report and how it will appear on the pages when it is printed.



Click to compress

There is a menu available at the top of the window picture below:



Click to compress

If you want to create a PDF file to send to someone, click the PDF button.

Print - Print the report

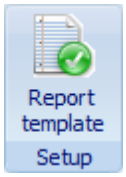
Use this button when you want to print your reports.

Sign - Click here to sign the report

You can specify a signature that can be used to digitally sign the report. A signed report is locked from further modification. Read more in section Signing.

If you click on this button and the report is already signed, you will be asked if you want to remove the signature.

Setup



Here you can modify the report template that defines the layout for the report.

You can here select report template or modify current report.

3.5.1 Create a report layout

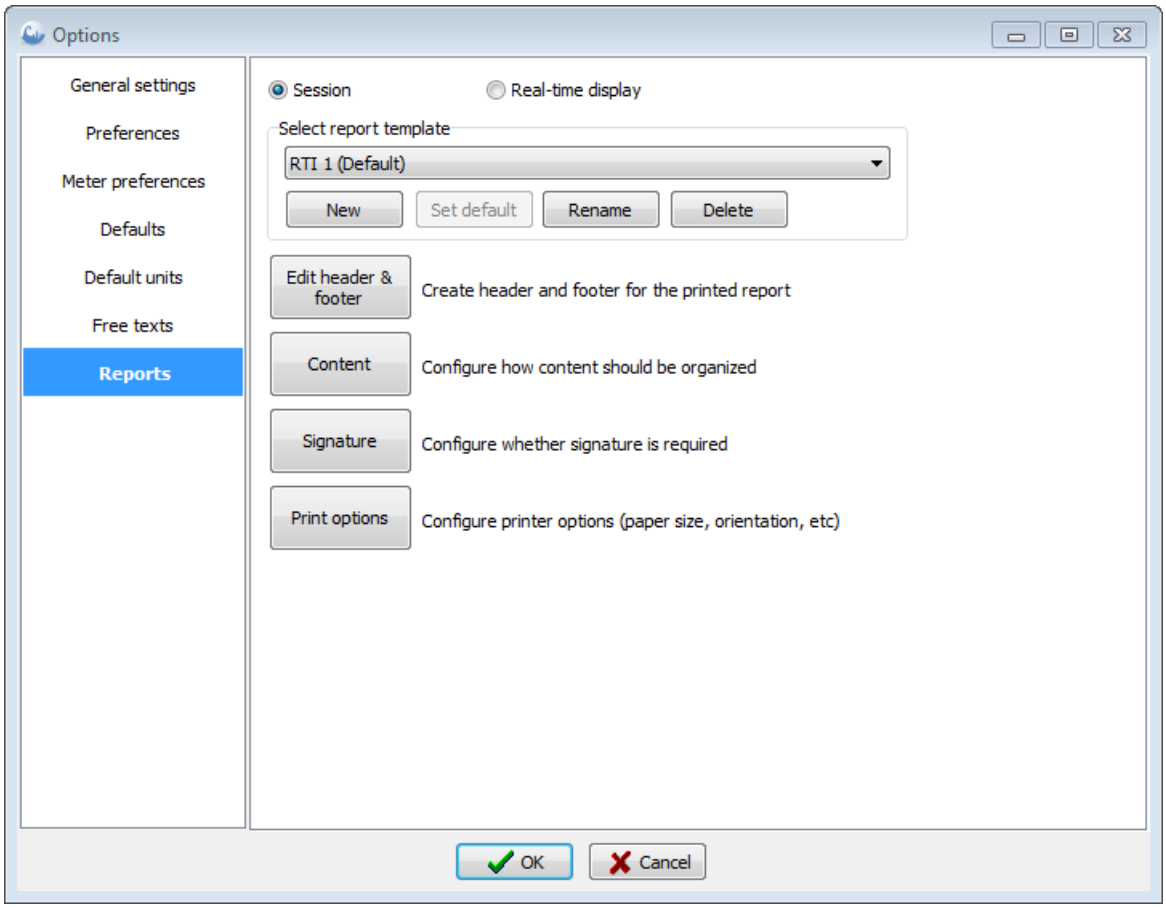
You can create create different layout templates for your report. Layouts can be created for both sessions and real-time displays. A layout template contains the following information:

- Header and footer
- Content
- Print options

You can create different of report layout templates and store them. They can easily be called and used whenever you want to print a report or create a PDF file. Create a report layout template:

1. Go to Program options.

2. Select Reports.



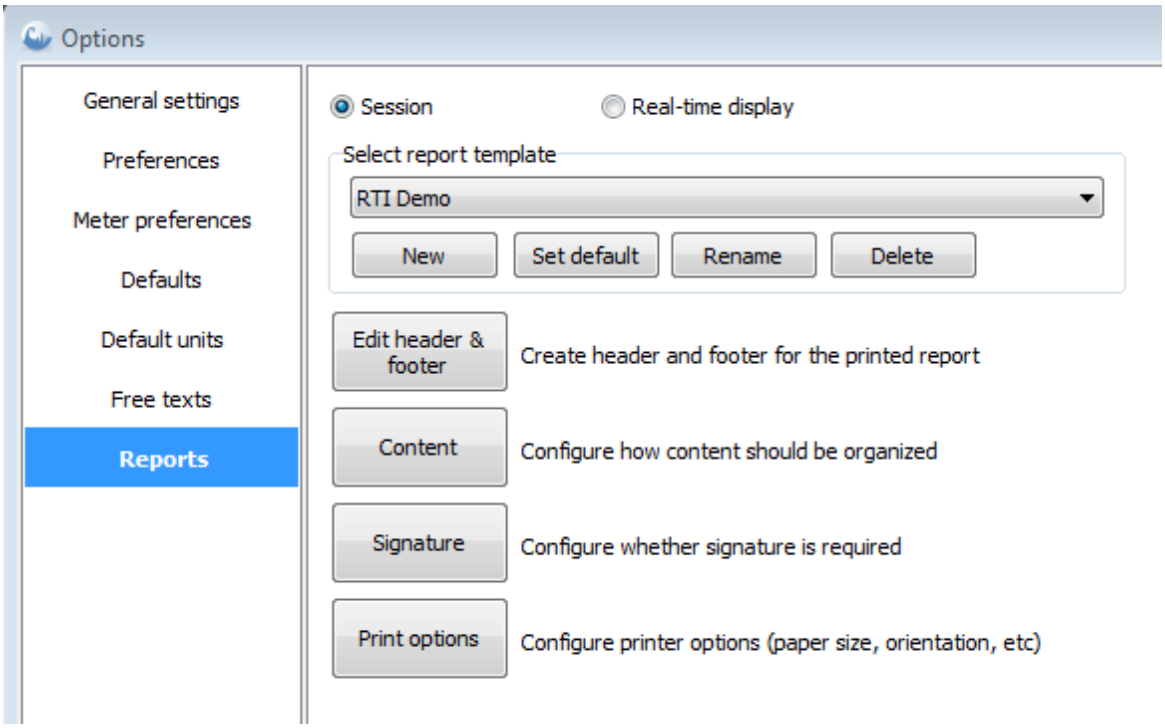
Click to minimize

3. Select Session or Real time display at the top.

4. Click on **New**.

5. Enter a name, for example "RTI Demo", and click OK.

6. The name is now shown at the top.



Click to minimize

You can now define Head, Footer, Content, Signature and Print options for the report layout. Each section below describes how to set up the different parts of a report template:

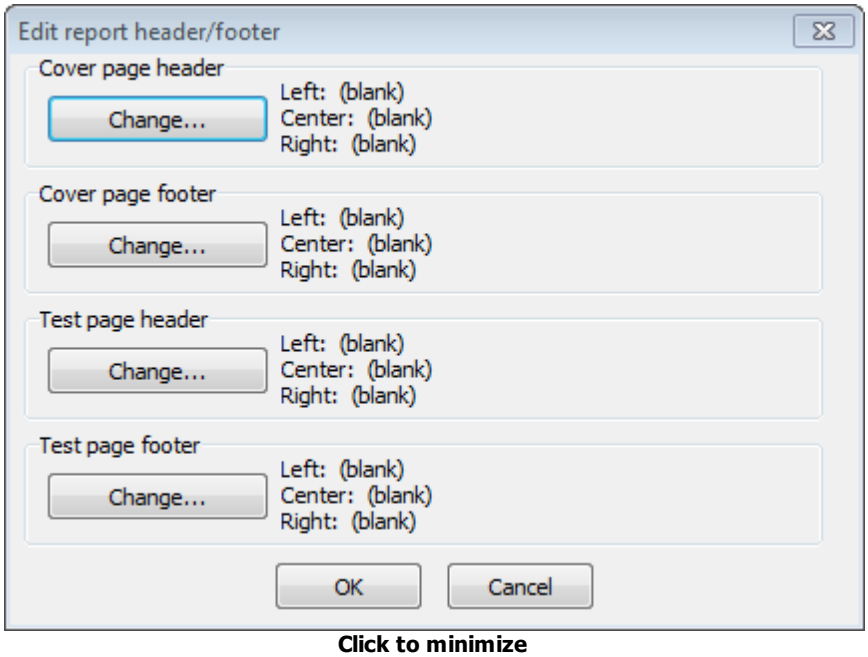
Header and footer - define header and footer

You can create your own header and footer for the printed report. Different headers and footers can be setup and stored in a layout for quick and easy use. You can add text and picturesand you can define the height for the header and footer.

1. Make sure that the name of the report layout template you want to specify/modify is shown at the top.

2. Click on the button "Header and footer".

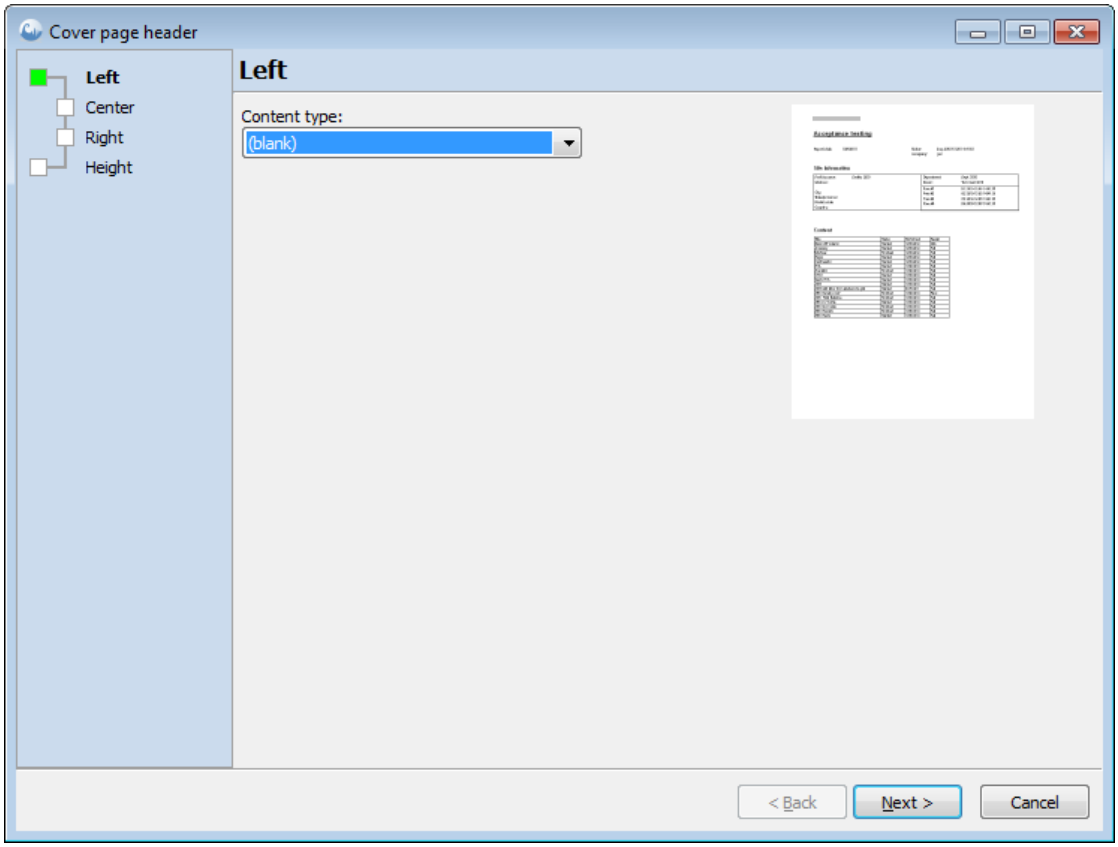
3. A dialogue is shown where you can set up individual header/footer for the cover page and the following pages.



Click to minimize

By default are both header and footer blank. You can now for each header and footer select content for left - center and right position. You select a text or a picture.

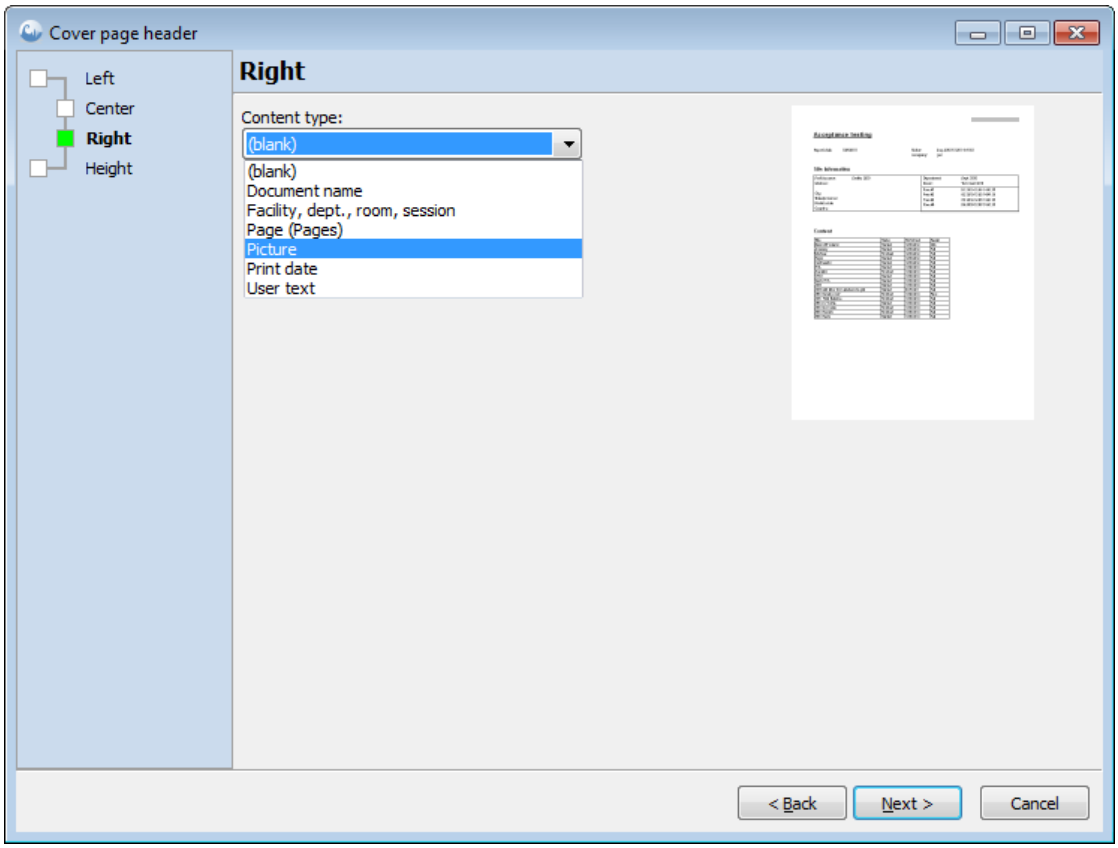
4. Click on the Cover page header button. Assume that you in the header just want to have your logo to the right.



Click to minimize

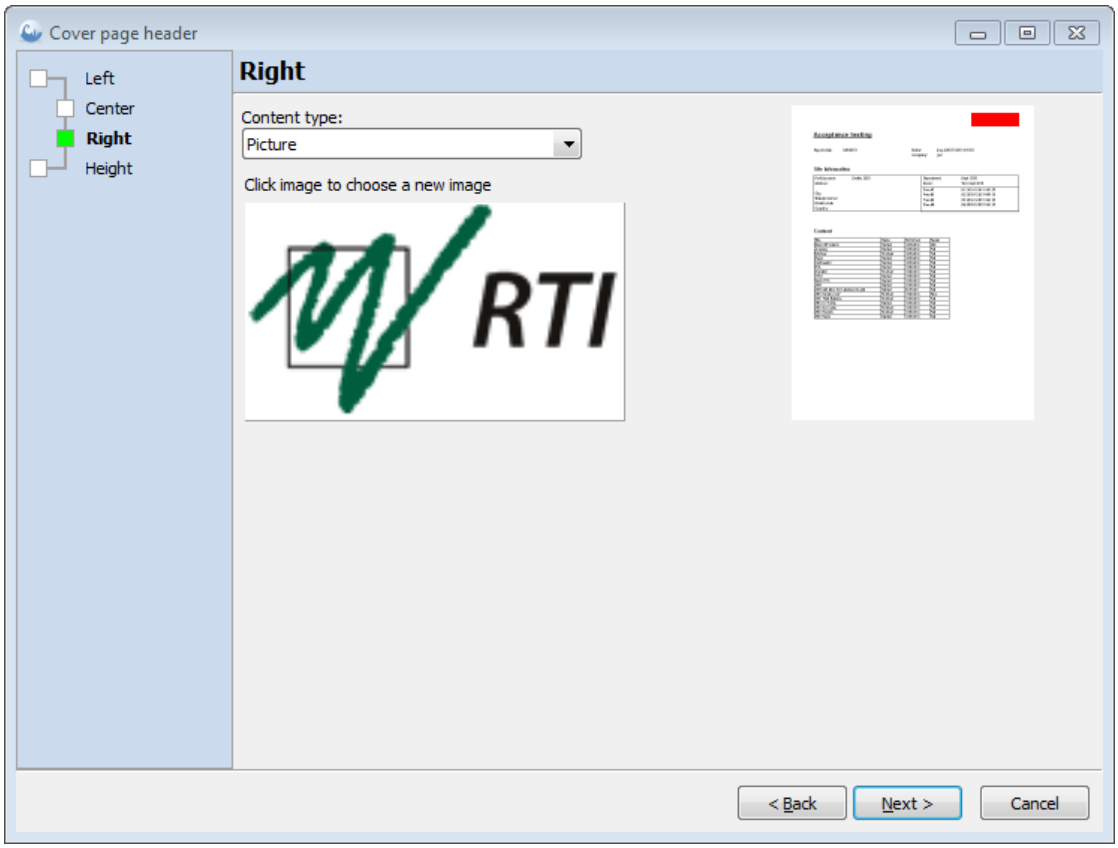
Just click Next here since you want to leave it blank, click also Next for the center position text.

5. Now are you asked to specify the right part of the header. Select "Picture" from the drop-down list.



Click to minimize

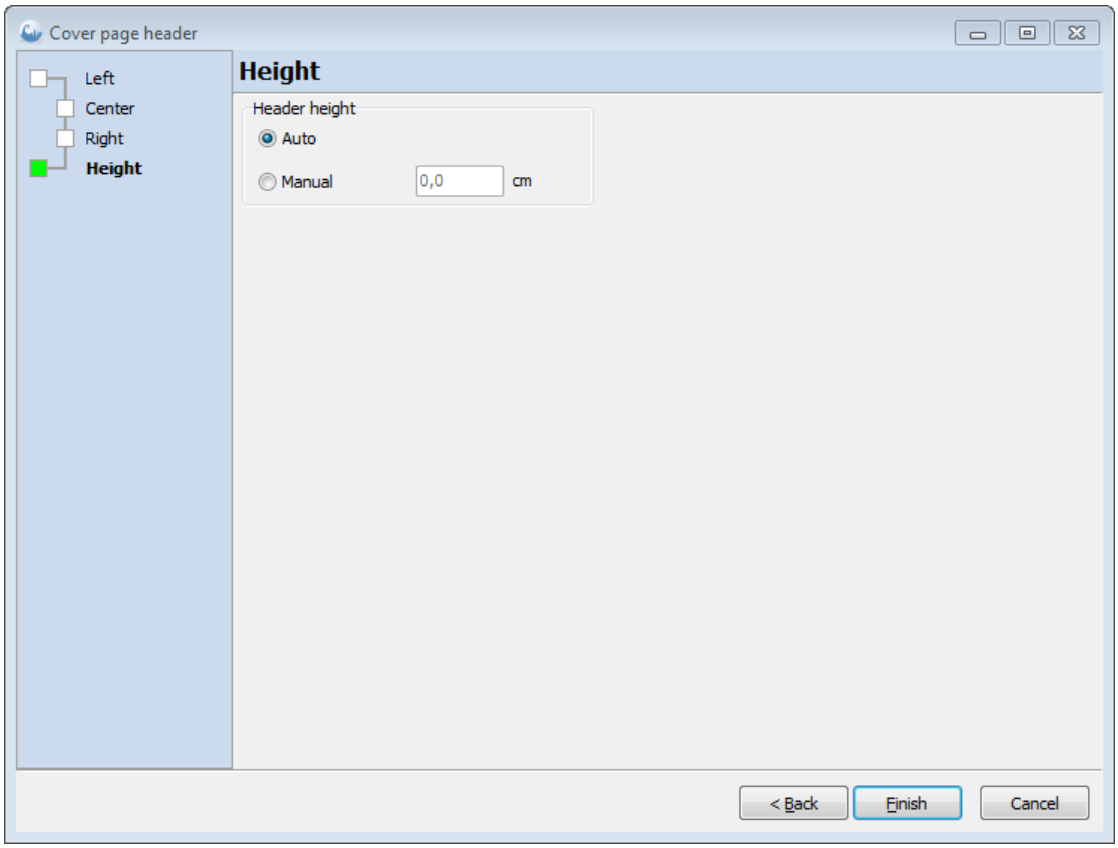
6. A frame appears, click on it and locate your logo picture.



Click to minimize

7. Click on Next.

8. Now specify the space you want the header to occupy.



Click to minimize

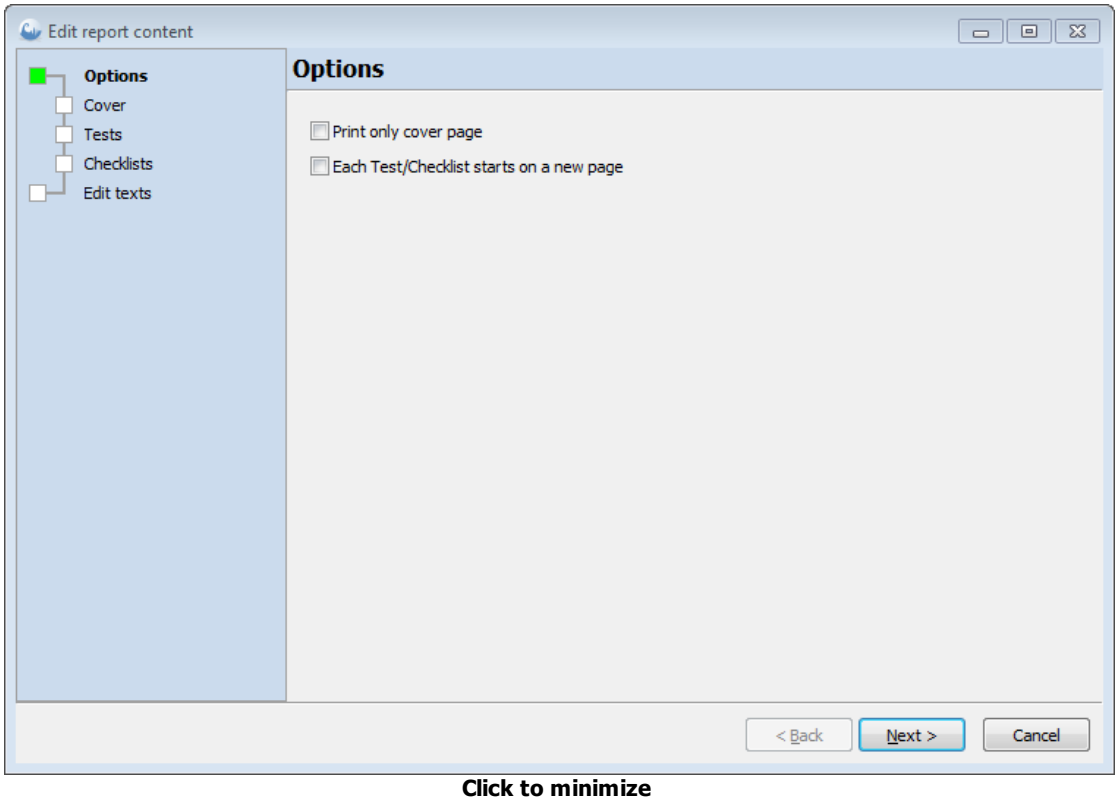
You can let Ocean auto size the header and specify it. Click Finish.

9. Repeat the same procedure for the other headers and footers.

Content - define different report characteristics

1. When you are ready with all headers and footers click on the **Content** button. A wizard is started that will allow you to modify the content in the report:

- Print only cover page
- Decide if you want each test to start on a new page
- for the cover, tests and checklists:
  - Change title for each section
  - Exclude or include sections
  - Change order of sections
- Modify all fixed texts in the report



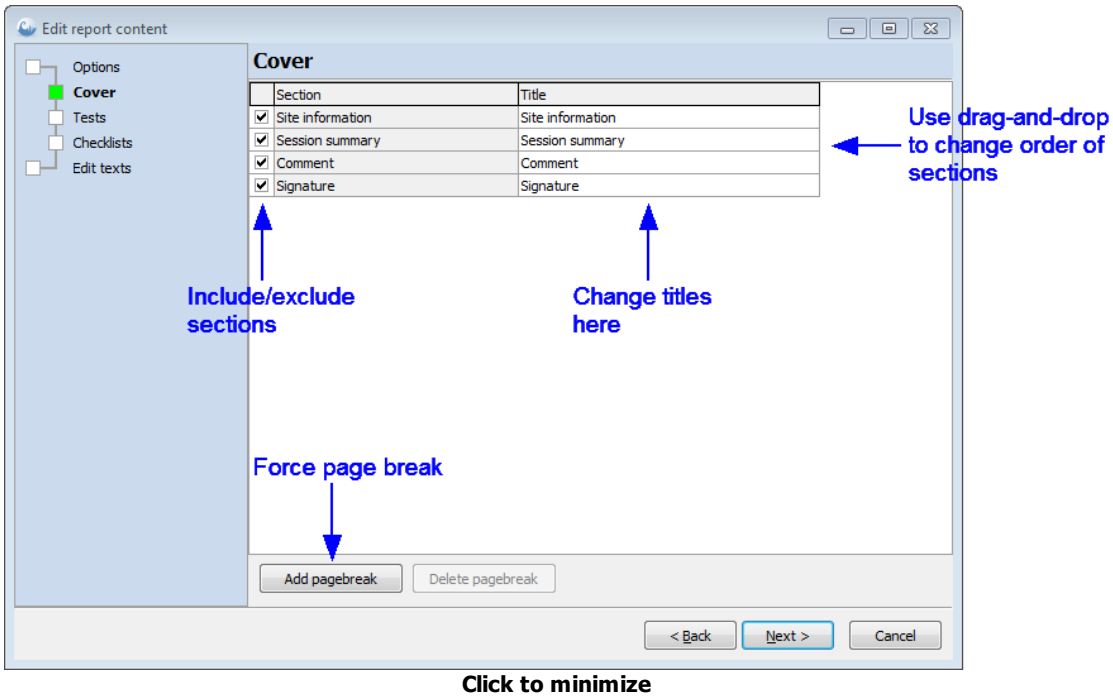
Click to minimize

Print only cover sheet
Only the summary page will be in the report

Each test/checklist starts on a new page
Each test and checklist in the session will start on a new page.

2. Make your selections and click Next.

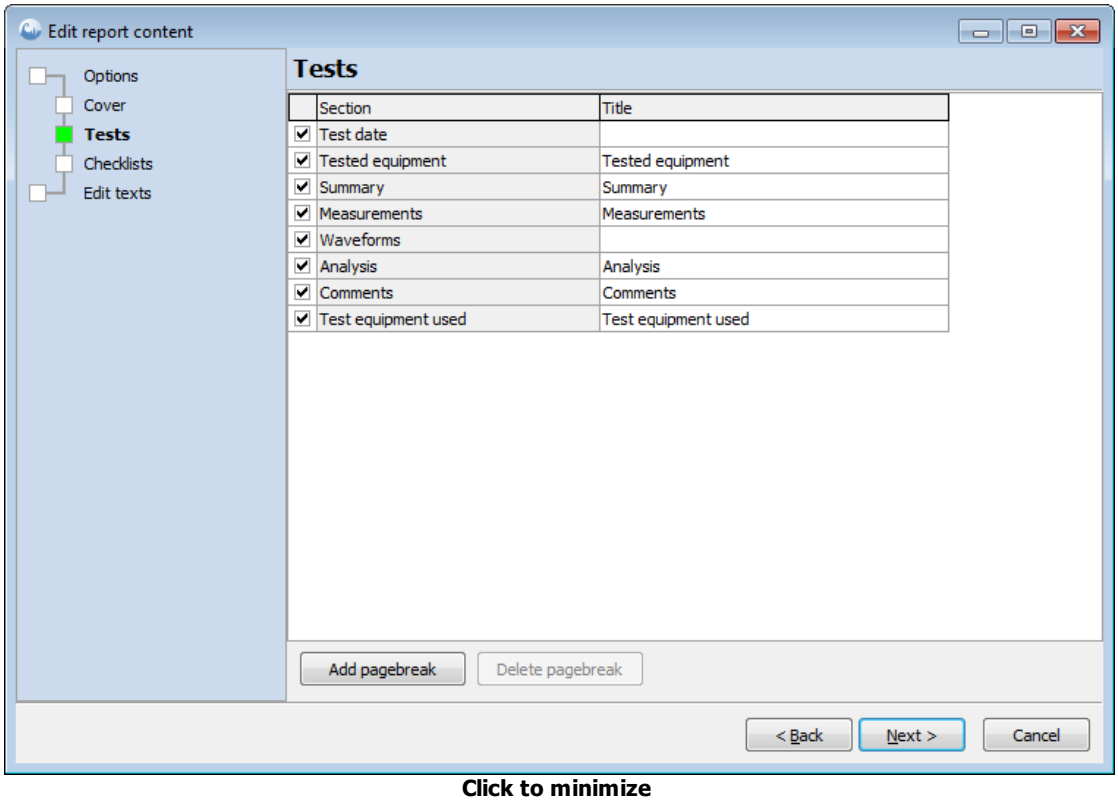
Here you can define how you want the cover page to look like:



Click to minimize

Click Next when you are ready.

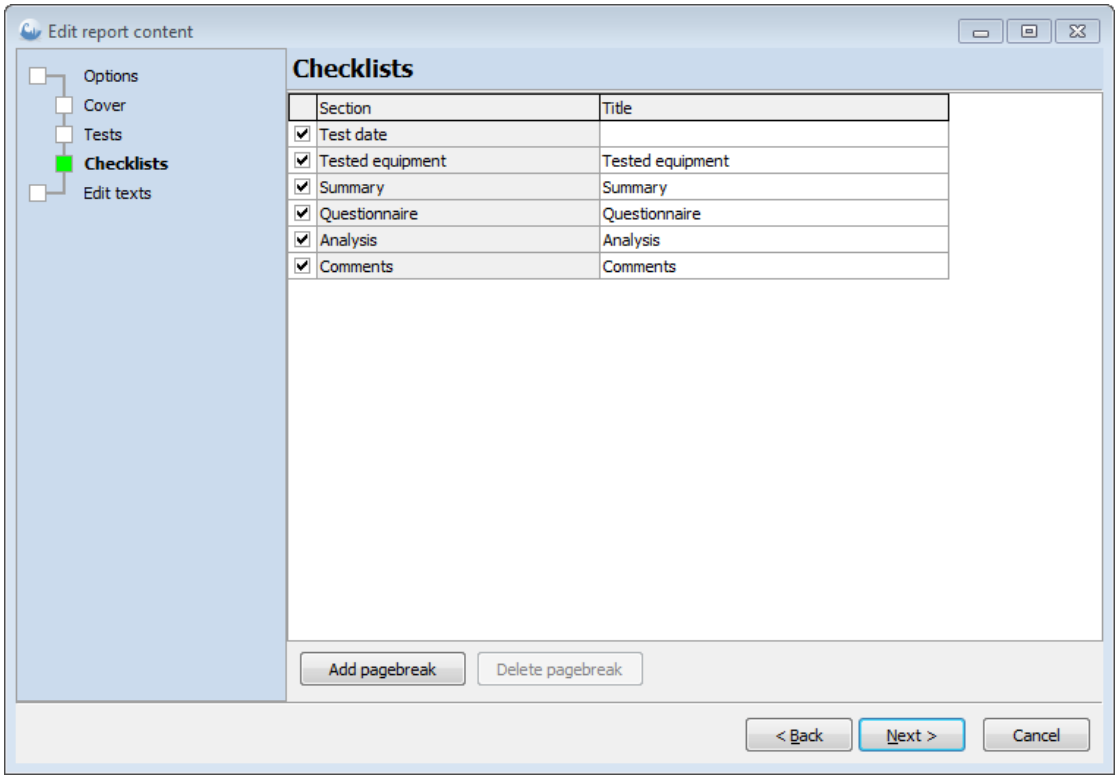
3. In the next step you can in the same way modify the look of tests:



Click to minimize

Click Next when you are ready.

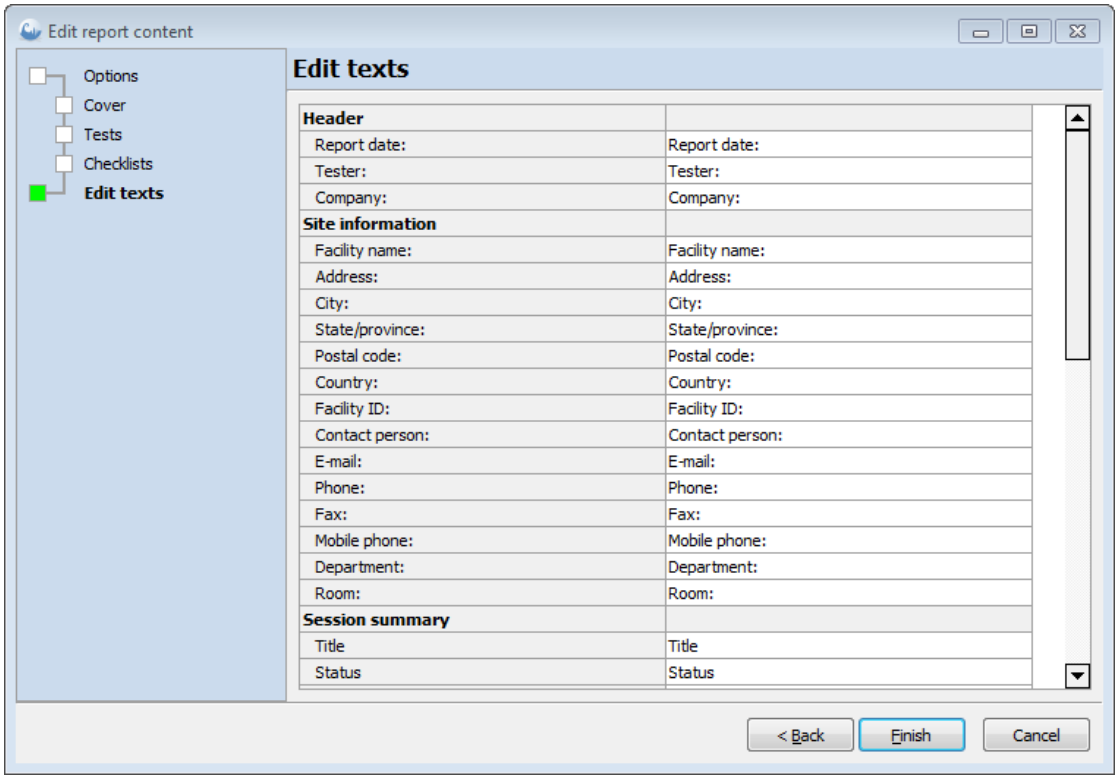
4. In the next step you can in the same way modify the look of checklists:



Click to minimize

Click Next when you are ready.

5. In the next step you can modify all "fixed" texts that appear in the report:



Click to minimize

Edit the texts and click Finish.

6. You have now defined how the content will appear in the report when you use this Report termplate.

Signature - define signature

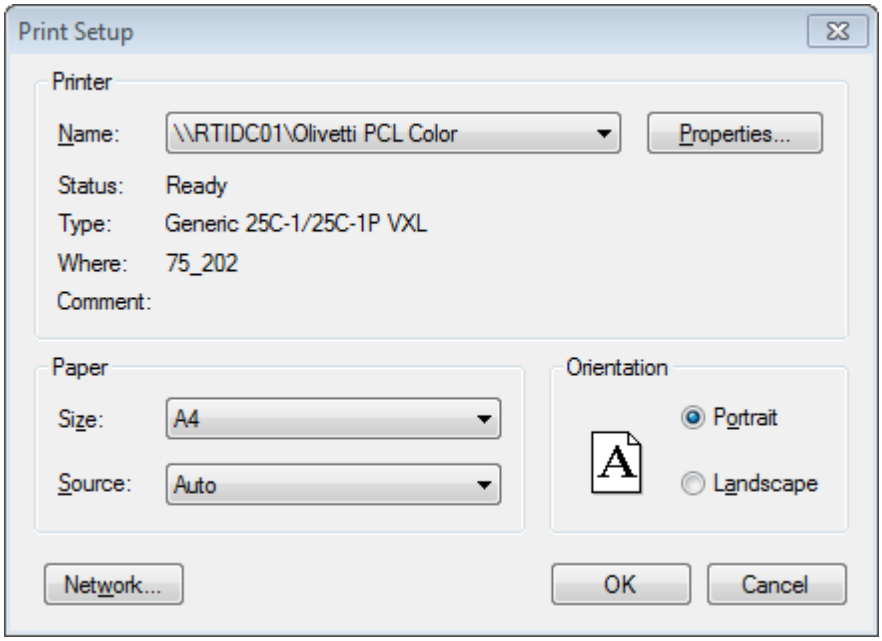
1. Here you define if the report should have a signature or not.


Signature options
Require signature
Require signature: You will be warned if a session is not signed when you print or export it.
OK
Cancel

2. Click OK to finish.

Print options - setup the printer

1. Now set the Print options.



Click to minimize

2. Click OK to finish.

3. You have now defined everything that is included in the report layout template "RTI Demo".

You can also modify an existing report layout template by selecting the name from the drop-down list and make necessary changes.

The report layout template can be assigned to a session template. In this way, the session template "knows" how the report should look like. You can have different report layouts if you have need for different headers and footers for different type of reports you create. The section Select report layout describes how you assign a report layout template to a session.

3.5.2 Make a report in your own language

You can create the entire report in your own language by doing the following steps:

1. Translate all texts in the templates you are using including analysis.

2. Make all checklists in your own language.

3. Create a report template and translate all texts into your own language.

4. Attach the report template to your session or real-time display.

5. Print the report

6. Confirm that all texts are translated. Make adjustments if required.

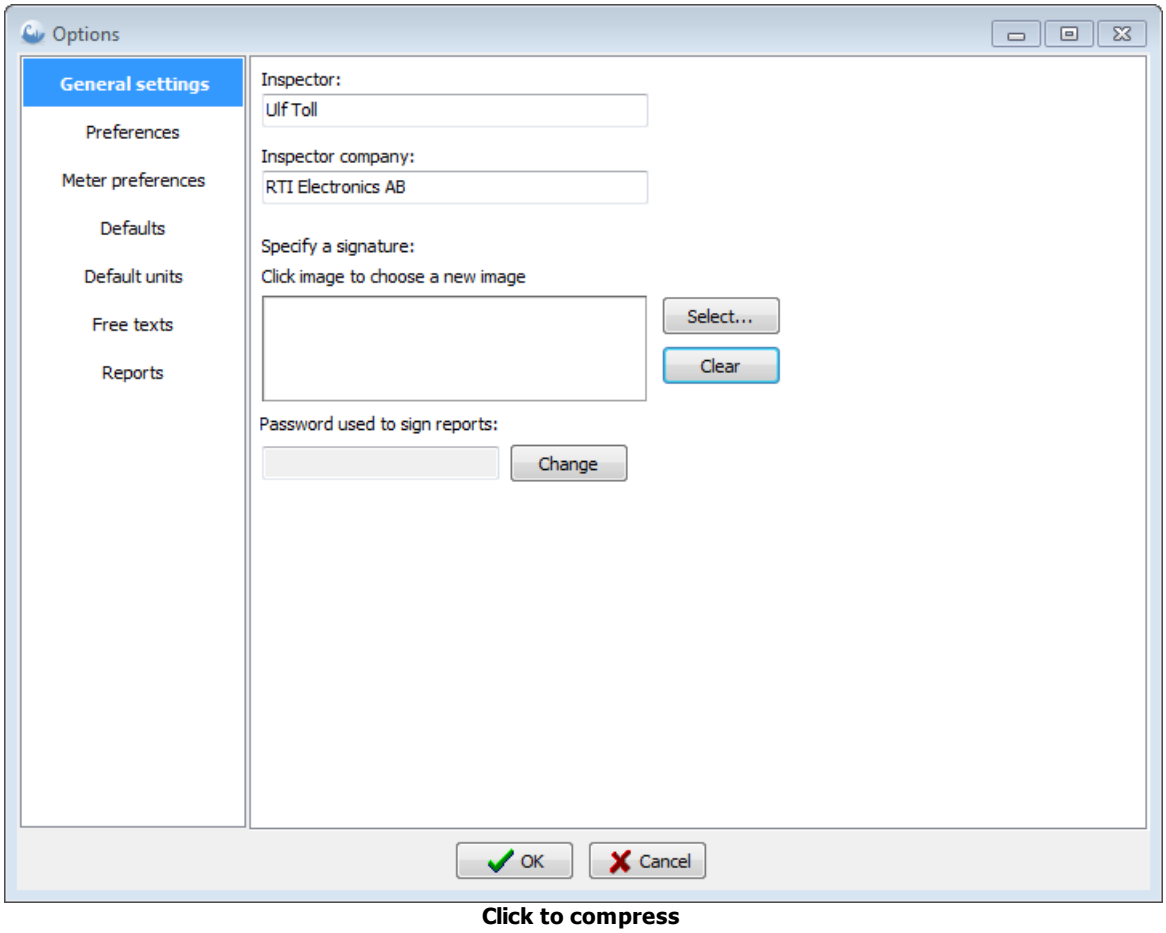
3.5.3 Signing

Ocean offer a feature for digital signing of sessions. You can specify a signature image and a password that must be used to put the signature on the report. When a session is signed, you can't modify it (save it again). You have an option to decide if signing is required. If you do this, Ocean will warn you when you print, make a pdf-file or exports the session that it is not signed. If you use Ocean Central, and signing is required, the session will not come up in the list for upload until it is signed.

To set up your signature:

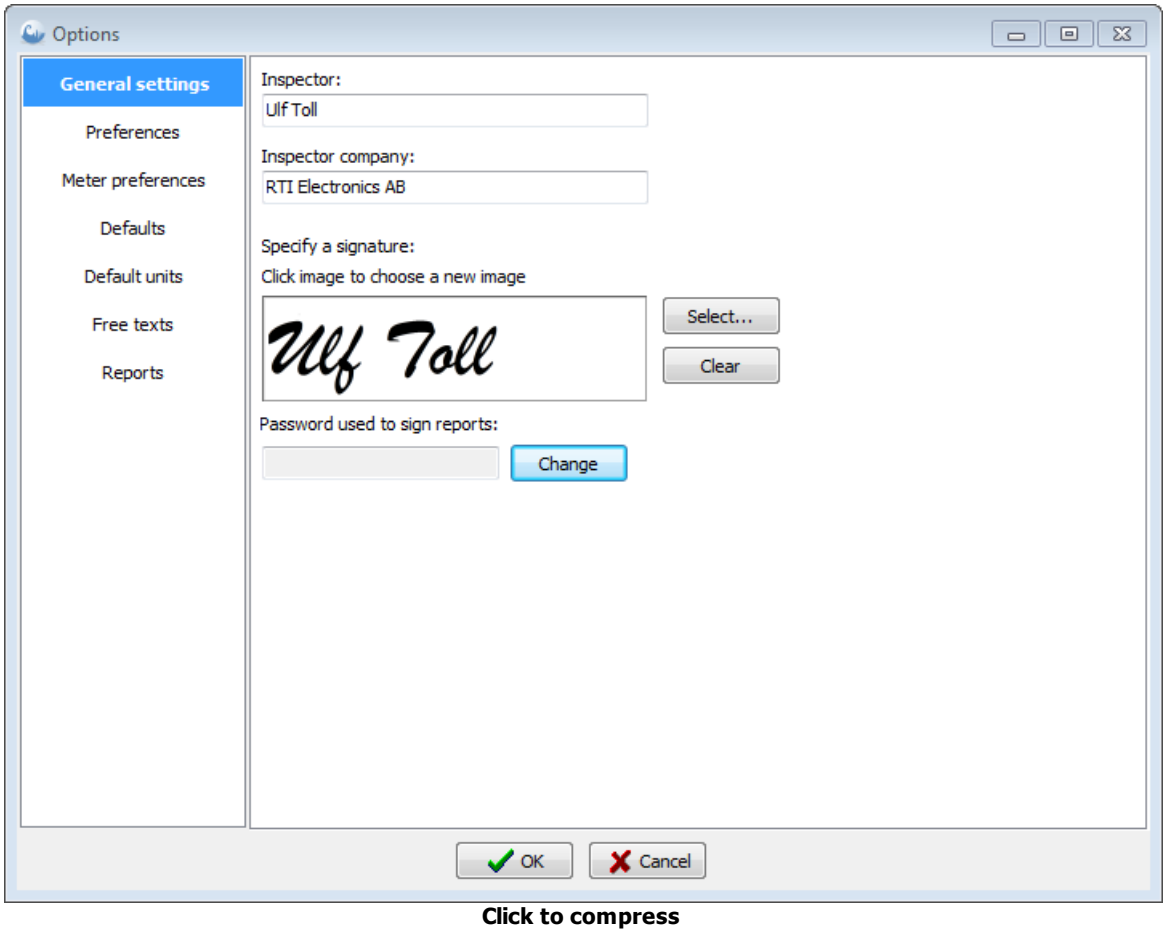
1. Go to the Program options.

2. The signing setup is shown as default.



Click to compress

3. Click on the **Select** button a look up your signature image.



Click to compress

4. Click on **Change** button to change/add a password. A dialogue is shown:



5. Type the password twice and click on OK. You have now created to your signature.

The signature file you have specified must not be moved or erased.

Open a session that is signed

When you open a session that is signed, a dialogue is shown:



If you want to open and just view the session, then click on OK. If you want to modify the session, then

click Remove signature.

3.5.4 Print a session

A session printed report is a bit different from a real-time display report, in that it has a cover sheet with the site information and a session summary outlining all tests and checklists included in the session. Each test is shown individually based on the report template used. The following information is available:

Each test has the following sections:

a) Title and a test date.
b) Tested equipment.
c) Summary of all analysis that is included in the test.
d) Measurements.
e) Waveforms (if included).
f) Complete analysis results.
e) Comments (if you have typed anything in the comment field).
f) Used test equipment. A list of the equipment, meters and probes, you have used. Serial numbers and calibration dates are included.

Each checklist has the following sections:

a) Title and a test date.
b) Tested equipment (if any).
c) Summary of all analysis that is included in the checklist.
d) Checklist with all questions.
e) Complete analysis results.
f) Comments (if you have typed anything in the comment field).

To preview and print a session:

Assume that you have an open session:

1. Go to the Reporting page on the ribbon.

2. Normally the report layout is defined by the session. You can see which report layout template will be used iIf you click on the Report layout button on the ribbon bar. You can at this point select another one if you want or modify the existing one. If you do the later, the changes will only affect this session. You can read more about report layout in the section Create a report layout.

3. Click on Preview.

4. You may want to select another report layout template or do some more modification.

5. Review the report.

6. You can now print directly or create a pdf file:

- Click on the pdf button to create a pdf file.
- Click on the print button to print the report.

3.5.5 Print a real-time display

A real-time display printed report has the following parts:

a) Title and a test date.
b) Tested equipment (must be filled out in the Equipment tab located on the right side of the main window).
c) Summary of all analyses the user selected to be included in the printed report (only Professional).
d) Measurements.
e) Waveforms (if included).
f) Analysis results (only Professional).
e) Comments (if you typed anything in the comment field).
f) Used test equipment. A list of the equipment, meters and probes, you have used. Serial numbers and calibration dates are included.

To preview and print a real-time display:

Assume that you have an open real-time display:

1. Go to the Reporting tab on the ribbon.

2. Normally the report layout is defined by the session. You can see which report layout template will be used iIf you click on the Report layout button on the ribbon bar. You can at this point select another one if you want or modify the existing one. If you do the later, the changes will only affect this real-time display. You can read more about report layout in the section Create a report layout.

3. Click on Preview.

4. You may want to select another report layout template or make some more modification.

5. Review the report.

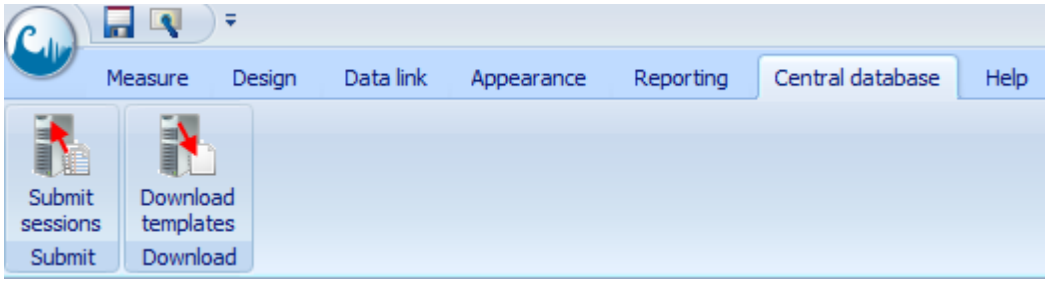
6. You can now print directly or create a pdf file:

- Click on the pdf button to create a pdf file.
- Click on the print button to print the report.

3.6 Central Database

This section is only relevant if you use Ocean Central. Ocean Central allows you to directly connect via a local network or internet to a computer that has a central Ocean database.

Functions are divided into two groups:

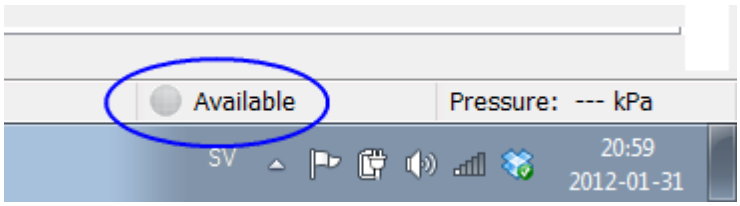


Click to minimize

Submit
Functions for submitting measured data to Ocean Central.

Download
Functions for downloading templates from Ocean Central.

There is an indicator on the lower Status bar that shows when you are connected to Ocean Central (via a local network or via internet):

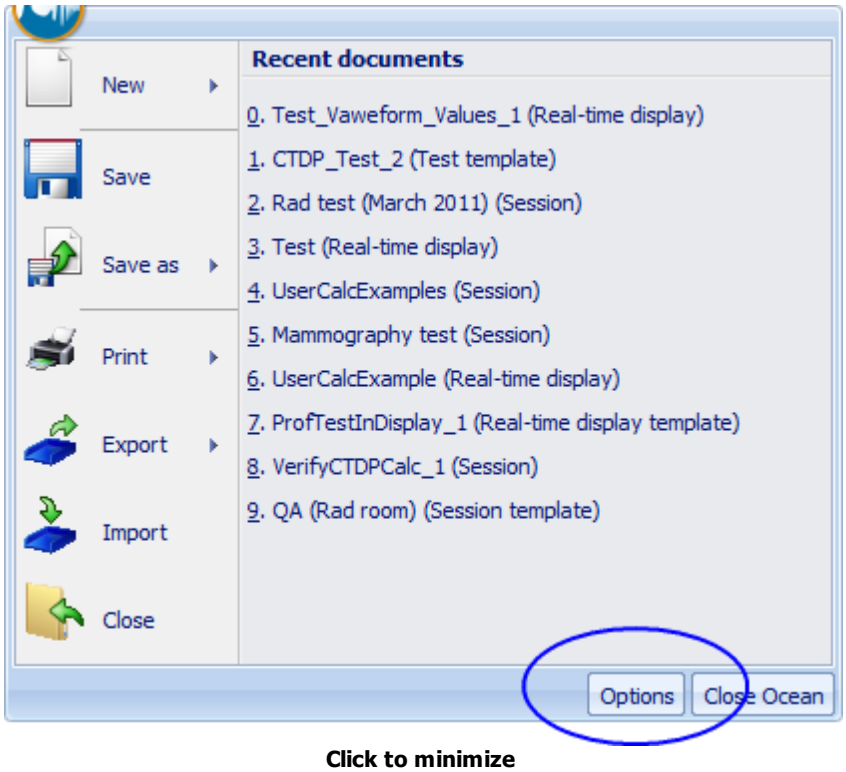


3.6.1 Setup Ocean to use Central

You must configure Ocean to use Ocean Central before you can use Ocean Central. Normally you get instructions for how to do this from the Administrator of Ocean Central.

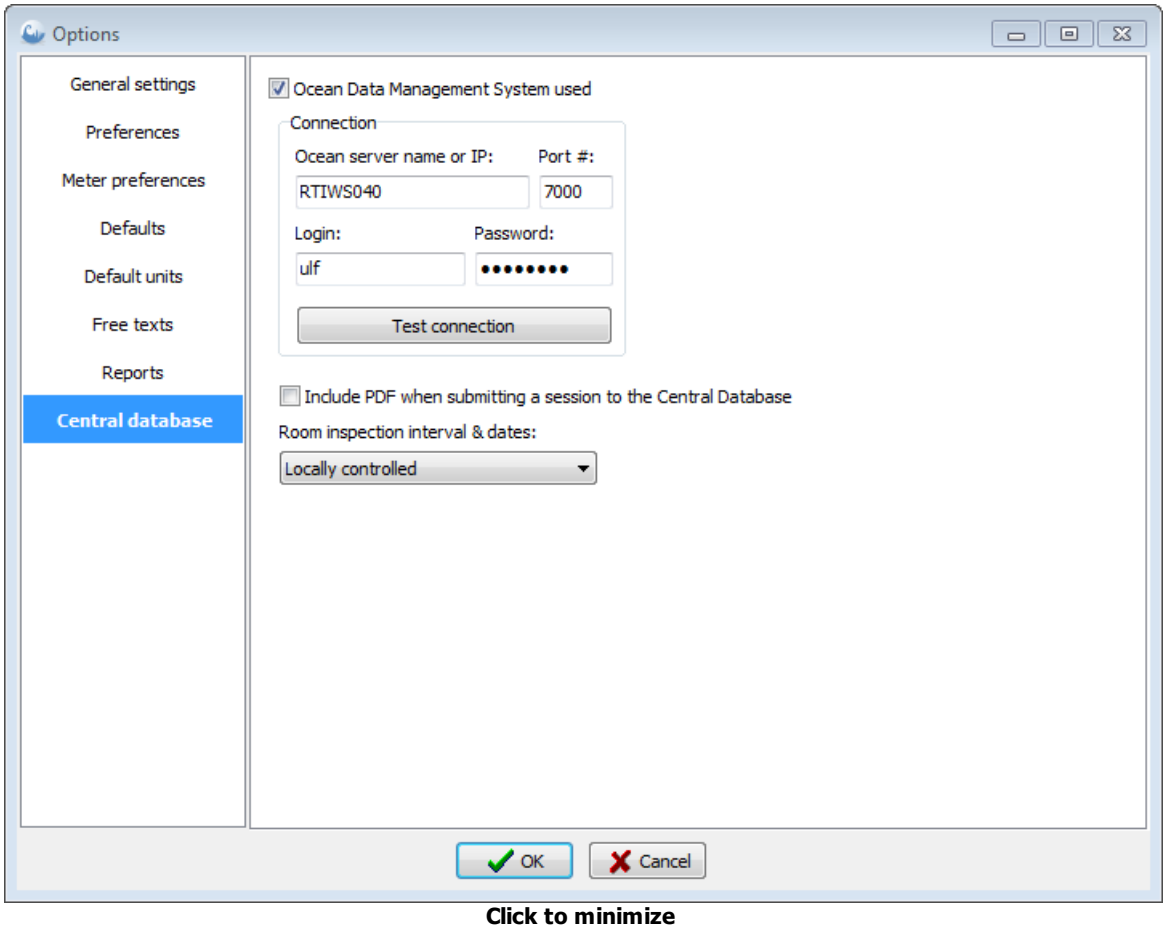
To setup Ocean to use the Central:

1. Go to the Program options.



Click to minimize

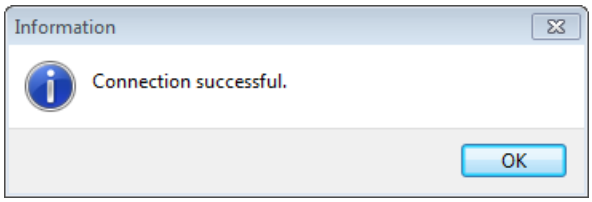
2. Select Central database and follow the instructions you have got from the Administrator.



Click to minimize

3. When you have entered settings, click on **Test connection** to see that you are connected.

4. If all works the following message should be shown:

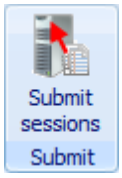


5. If connection fails, check the following:

- check that all parameters are correctly entered
- check that you have internet connection
- check that any local firewall isn't blocking communication
- contact the administrator

NOTE!
To be able to send a session to the central database the site (facility/department/room) it belong to must have ID.

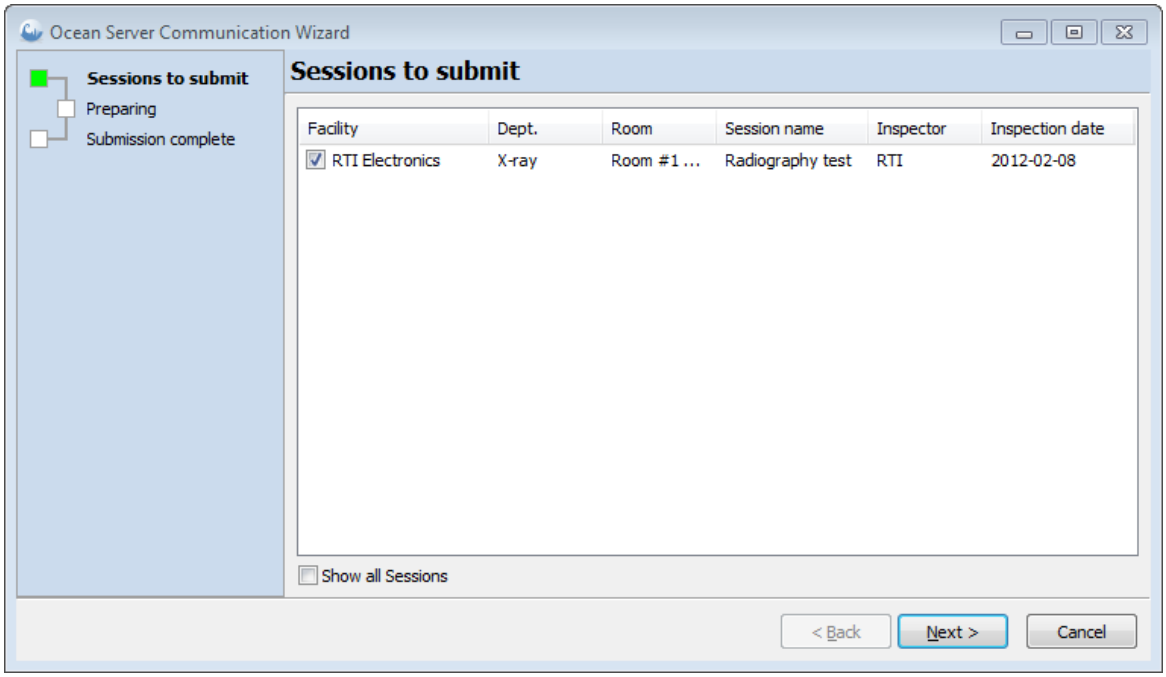
3.6.2 Submit sessions



Click here to upload sessions to the central database.

1. A wizard starts and shows the sessions that are ready to be submitted to central database. The wizard shows the following sessions:

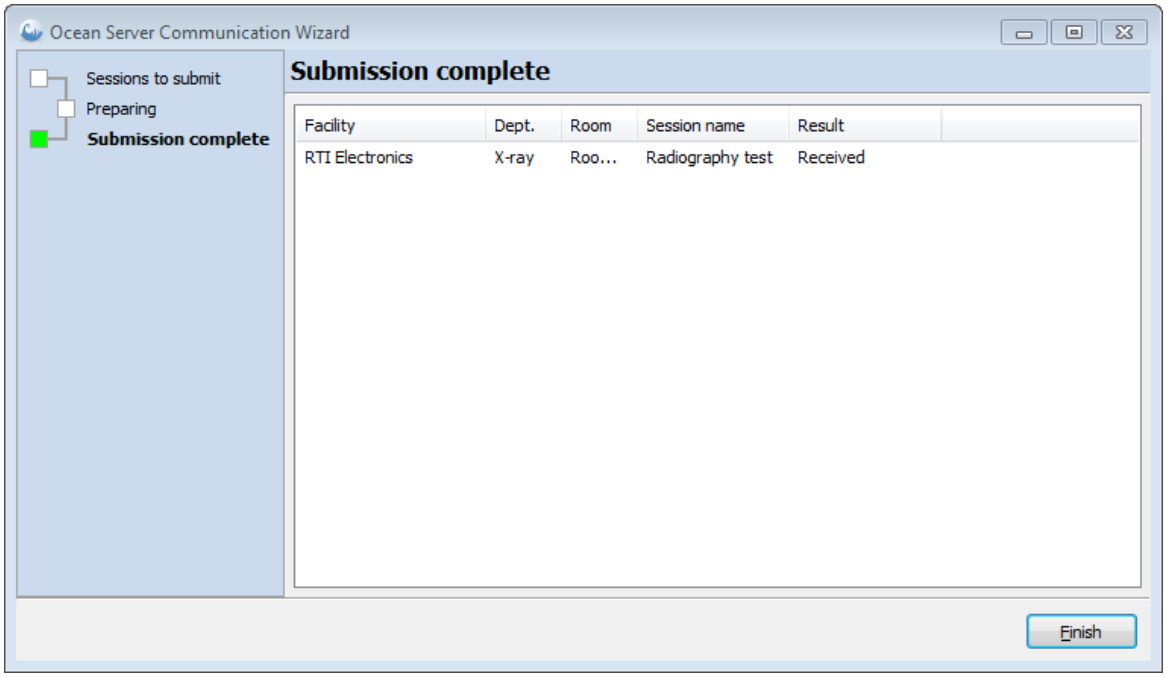
- Sessions that are completed.
- require a signature, that are signed.



Click to compress

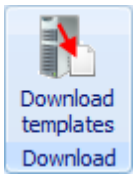
2. If you want to upload a sessions that already have been submitted or are not considered to be completed, check **Show all sessions**. You will then be able to select any session in your database.

3. A progress bar is shown while data is sent to the central database. When it is completed a report is shown:



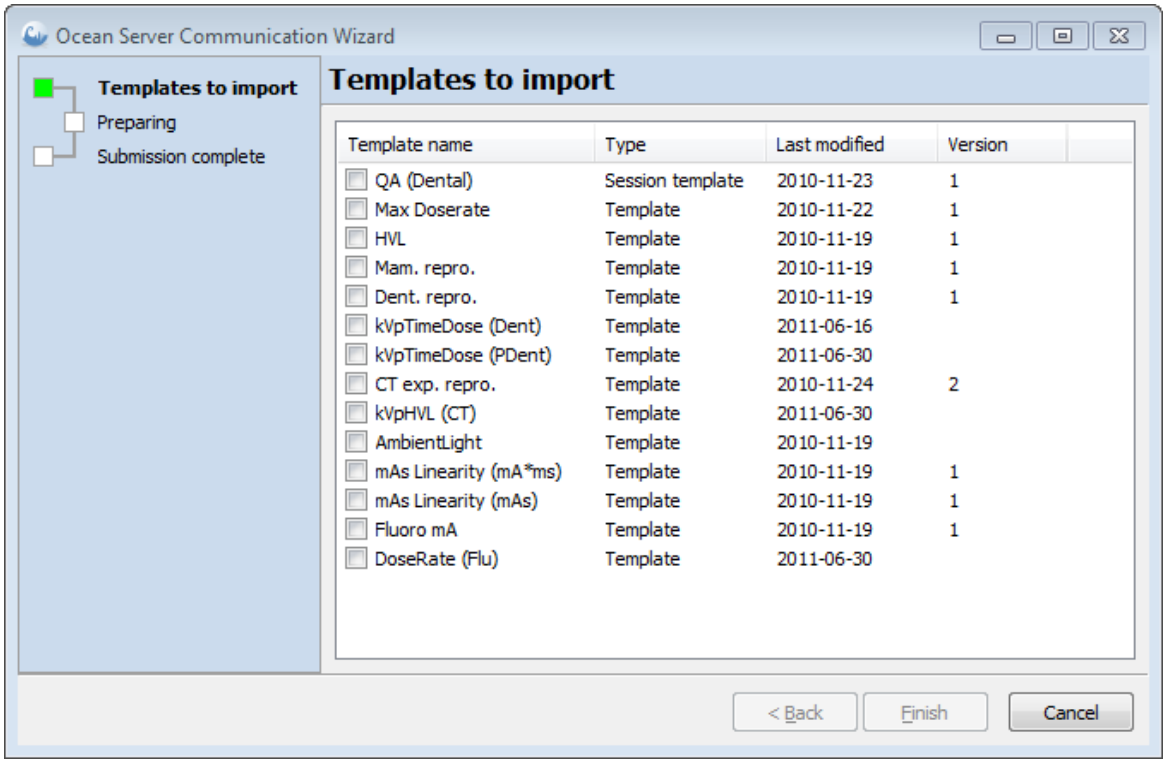
Click to compress

3.6.3 Download session templates



Click here to download session or real-time templates from the central database.

Click here to download templates from the central database.

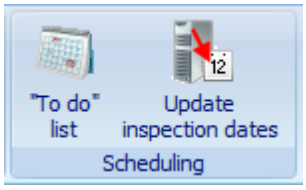


Click to compress

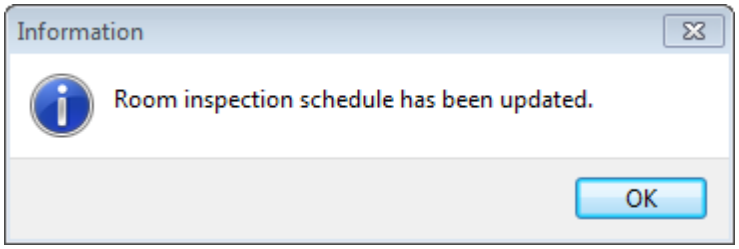
You will see a list with all session templates that the administrator of the central database has made available for you. All templates you select will go to the "session template inbox" and real-time displays to the "Real-time display template inbox" in the Library, repectively.

3.6.4 Inspection dates and intervals

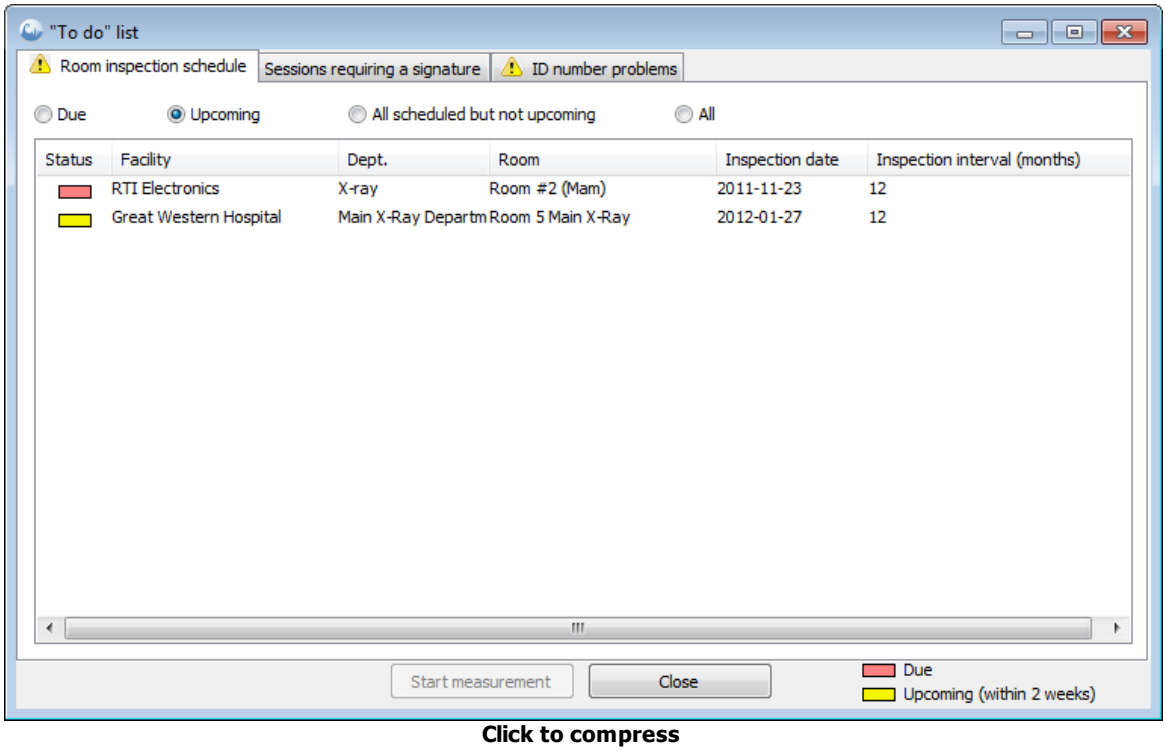
If Ocean Central is used and the administrator has decided that inspection dates and intervals should be centrally controlled, by clicking on the button on the ribbon bar.



When your local database is updated with new inspection dates the following message is shown:

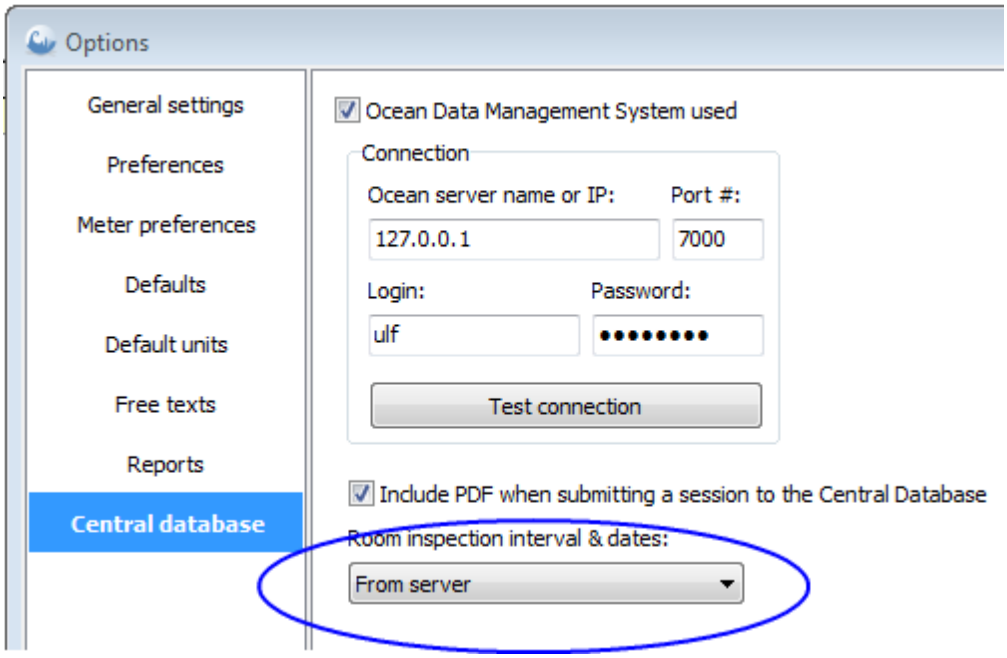


Your To-do list will show upcoming inspeactions:



Click to compress

It is shown in Program options how inspections dates are controlled. Don't change this unless the Ocean Central administrator has asked you to do so.



Click to compress

3.7 Help

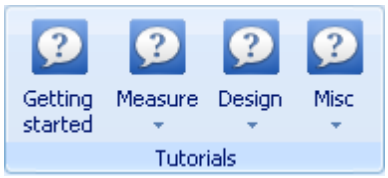
The help system contains topic by topic detailed information on Ocean's many features and functions to help you get the most out of Ocean. You can easily access the help system by clicking on the Help tab on the Ribbon bar if you are not sure how to use a certain function or feature.

Help



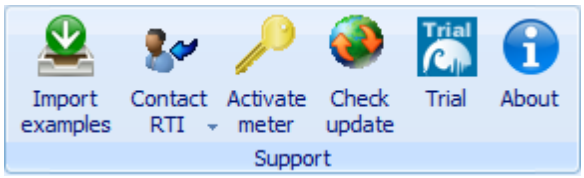
These two buttons give you quick access to the help system table of contents and the FAQ section.

Tutorials



We have added these tutorials to help you get started with Ocean quickly and efficiently.

Support



This section is for you to use if you need to report an error or get some example templates.

Import examples

Click on this button, and you can import new example templates into Ocean to help you get started. This function is useful after an update if new examples are available. For further reading see topic Import Examples.

Contact RTI

Use this button if you want to contact RTI or report a problem or suggest an improvement. There are two choices:

- **Review** - Send comments, suggest improvements and new functions.
- **Make support file** - Create a support file to report a problem or suggest an improvement. For further reading see topic Create support file.

Activate meter

Use this button to install a new license into your meter. For further reading see topic Activate meter.

Check update

This function will check if you are running the latest Ocean software and meter firmware. Note that the meter firmware is only checked when your meter is connected to Ocean. To use this feature your computer must be able to use the internet.

Trial

Click this button if you are using Display or Connect and want to try a higher license level with your meter. You then get a 45-day trial period. Please note that you can only do this once.

Note: You can click on this button at any time if you want to try another license level without a meter connected. For further reading see topic Trial.

About

Clicking this button shows the program version and contact information.

Database



We have added these features to manage your database.

Import

You can import site information from

- Facilities, rooms,generators and tubes from oRTIgo (or the Canadian version XR).
- Facilities, departments, rooms, generators, tubes and user-defined equipment from Excel or Calc.

oRTIgo is not using "Departments" as Ocean does. All departments for imported facilities in Ocean will be named "Department".

Backup

Click on this button when you want to make a backup of your database. A dialogue will be shown asking you to choose where you want to store the back-up file. It is highly recommended that you back up your data on regular basis.

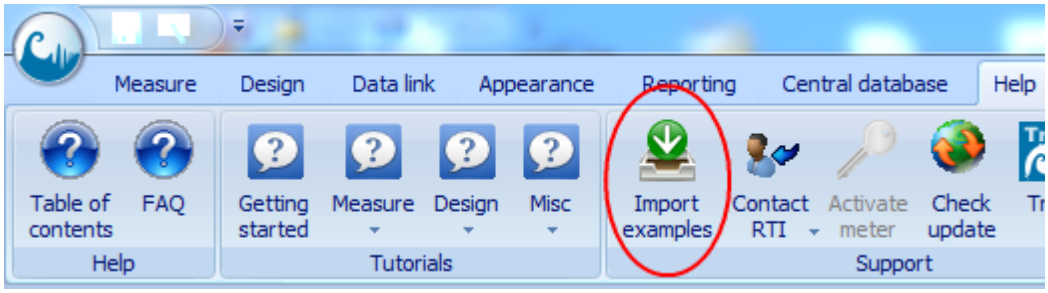
Location of the database file

Depending on the operating system you have, the database file can be found at the following location:

XP: Documents and Settings\All Users\Application Data\RTI Electronics\Ocean
Vista or Win7: ProgramData\RTI Electronics\Ocean

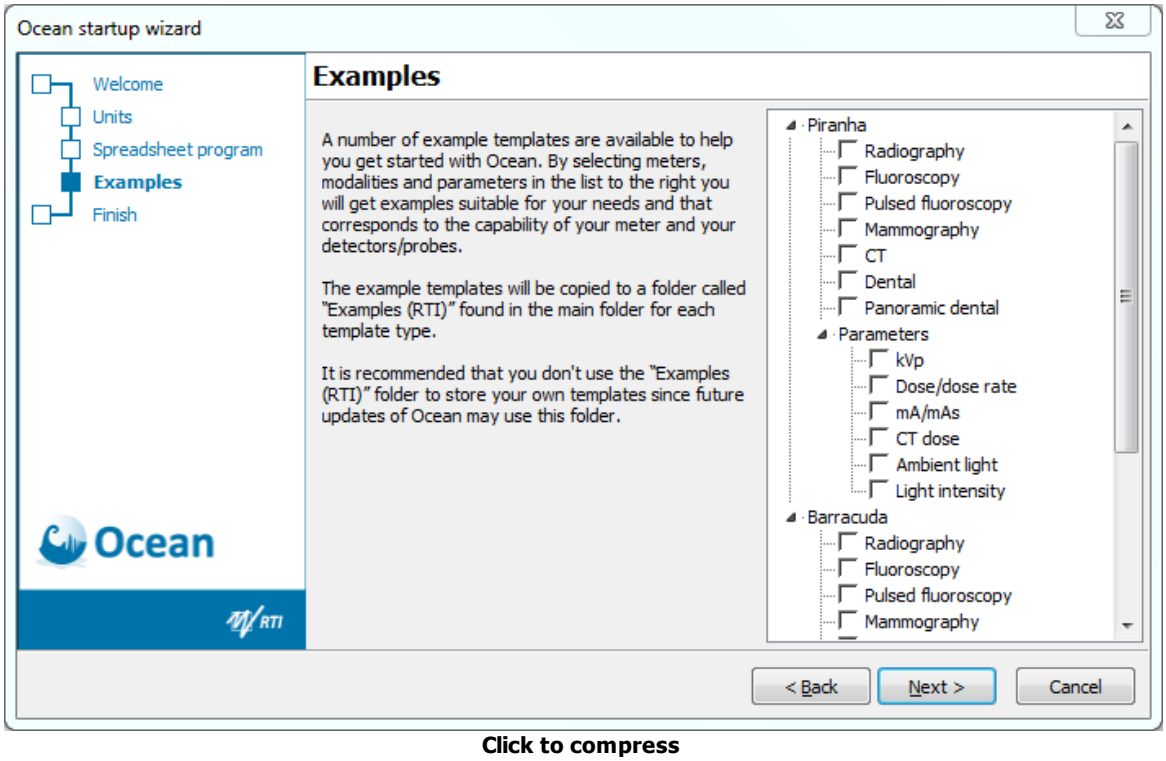
3.7.1 Import examples

When you installed Ocean you had the opportunity to load example templates ready to use directly. You can at any time import more examples (if you didn't select all of them when you installed Ocean or after an update). Go to the Help page and click on Import examples.



Click to compress

The Ocean Setup Wizard starts. Click on the Next button until you come to the Examples page.


Ocean startup wizard
Welcome
Units
Spreadsheet program
Examples
Finish
Examples
A number of example templates are available to help you get started with Ocean. By selecting meters, modalities and parameters in the list to the right you will get examples suitable for your needs and that corresponds to the capability of your meter and your detectors/probes.
The example templates will be copied to a folder called "Examples (RTI)" found in the main folder for each template type.
It is recommended that you don't use the "Examples (RTI)" folder to store your own templates since future updates of Ocean may use this folder.
Piranha
Radiography
Fluoroscopy
Pulsed fluoroscopy
Mammography
CT
Dental
Panoramic dental
Parameters
kVp
Dose/dose rate
mA/mAs
CT dose
Ambient light
Light intensity
Barracuda
Radiography
Fluoroscopy
Pulsed fluoroscopy
Mammography
Ocean
RTI
< Back
Next >
Cancel

Click to compress

Select the modalities and parameters you want to load examples for.

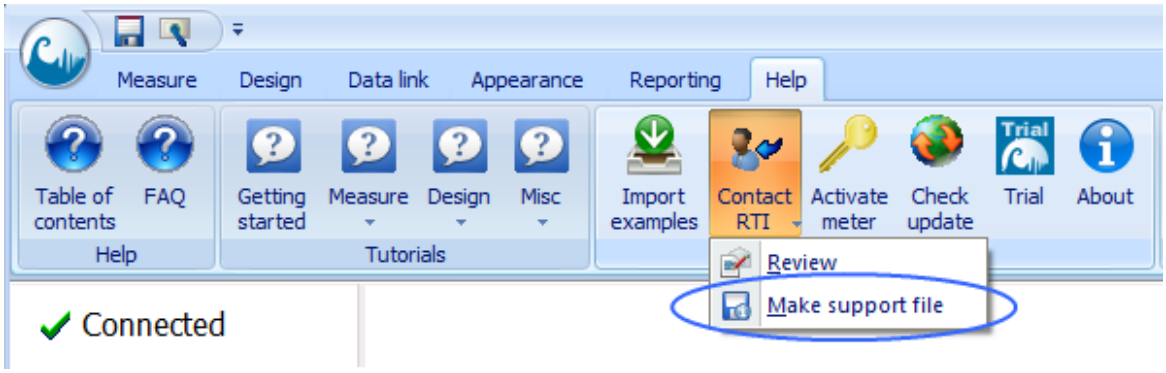
Note!
Existing examples will be updated if you reload examples you already have loaded before. Make sure, if you want to modify an example template, to copy it to another place.

3.7.2 Create support file

Ocean users are encouraged to send error report data to RTI Electronics AB, Error Data Collection department via e-mail. We also encourage feed-back from users regarding the program and invite suggestions on how we may improve our product.

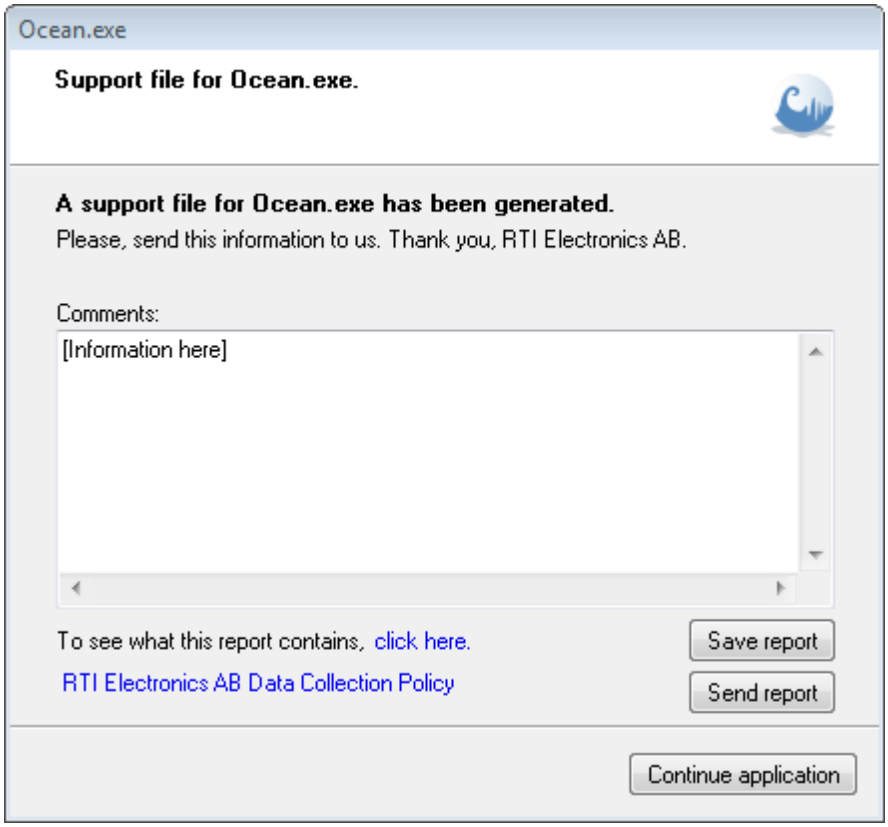
We have added a "Contact RTI" button for your convenience. This button is located on the Help tab of the Ribbon bar (see picture below).

When you want to make a support file, just click the "Make support file button".



Click to compress

When you clicked the button, a dialogue window (like the one you see below) will appear and you can type a detailed report of the error you encountered or any suggestion you may have in the "Comments" window.


Ocean.exe
Support file for Ocean.exe.
A support file for Ocean.exe has been generated.
Please, send this information to us. Thank you, RTI Electronics AB.
Comments:
[Information here]
To see what this report contains, click here.
RTI Electronics AB Data Collection Policy
Save report
Send report
Continue application

Click to compress

In addition to the problem description or improvement suggestion, several files are collected and appended to the report. If you would like to see what files are being collected and sent, you can click on the hyperlink next to "To see what this report contains" text.

You have the option to send the report right away or to save it on your desktop and send it later. The e-mail address to send your report to is: **Ocean@rti.se**.

When you are finished making the report, click the "Continue application" button to continue working with Ocean.

Read our error report collection policy here: "RTI Electronics AB Data Collection Policy"

3.7.3 Data Collection Policy

RTI Electronics AB Data Collection Policy

Users are encouraged to send all error report data, no matter how minor it may appear, to RTI Electronics AB, Error Data Collection department via e-mail. We also encourage feed-back from Ocean users regarding the program and invite suggestions on how we may improve our product. Your input is an important step to ensure we deliver a product that is as bug-free as we can make it, and one that users find easy to use and powerful enough to meet their X-ray equipment quality assurance testing needs.

Why error data is collected

We, at RTI Electronics AB, made every effort to extensively test and find bugs as they happen during the development cycle, and we will continue our efforts after Ocean is released. However, it is possible that in spite of all our efforts some bugs may have gone undetected. We are committed to excellence in our software, so learning about and fixing the problems reported to us by users is a top priority. When you choose to send an error report, a small snap-shot of the state of your application at the time the error occurred is transferred to RTI Electronics AB. This data is used by our software engineers to diagnose and correct the problem.

These reports we collect are actively used by RTI Electronics AB and its partners to continually improve the reliability of the software you use and to identify potential new ideas and improvements for implementation in future Ocean versions.

Error report data is used to find and correct problems in the software you use. It is not used for marketing purposes, and it is kept strictly confidential, except in cases where a third-party product is involved.

What data is collected

To fix problems in the software we not only need to know about what the software was doing at the time the error occurred, but also about your instrument configuration. For this purpose, when an error report is created, a snap-shot of your computer memory is taken that may contain personal and confidential information. For instance, the snap-shot of memory may contain your name, part of a document you were working on, or data you recently submitted to a Web site. It is also possible for such personal information to be included in the log file, a portion of the registry, or other product-specific files needed to determine the cause of the error.

If you are concerned that the report may contain personal or confidential information, please do not send the report.

How data is stored

When we receive an error report, we use a variety of security technologies and procedures to protect your personal information from unauthorized access, use, or disclosure. For example, we store the error reports on computer servers with limited access.

Who has access to error report data

RTI Electronics AB employees, contractors and vendors who have a business need to use the error report data are provided access. If the error report indicates that a third-party product is involved, RTI Electronics AB may send the data to the vendor of that product, who may in turn send the data to sub-vendors and partners.

We thank you for your continued support in making our software the preferred choice by X-ray equipment quality assurance testing professionals. It is our commitment to bring the best, most bug-free software experience to Ocean users all over the world.

RTI Electronics AB, Research & Development Department.

3.7.4 Activate meter

Use this button if you need to install an Ocean license into your meter. All meters manufactured before December 2010 don't have a license installed. If the meter is missing a license Ocean will normally ask for it when you connect your meter to Ocean for the first time. Units manufactured after December 2010 come with the Display license already installed. Use the Activate meter button if you need to upgrade your license to a higher level.

To activate or upgrade the license stored in the meter, follow the steps below:

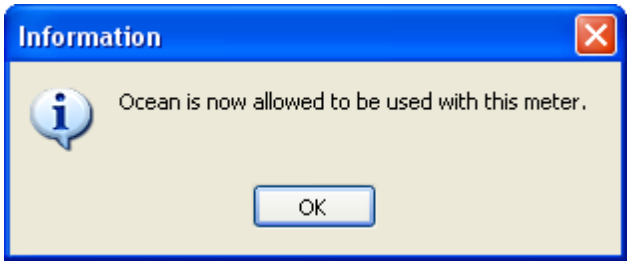
1. Click Activate meter.

2. A dialogue is shown:



3. Enter the license key and click OK.

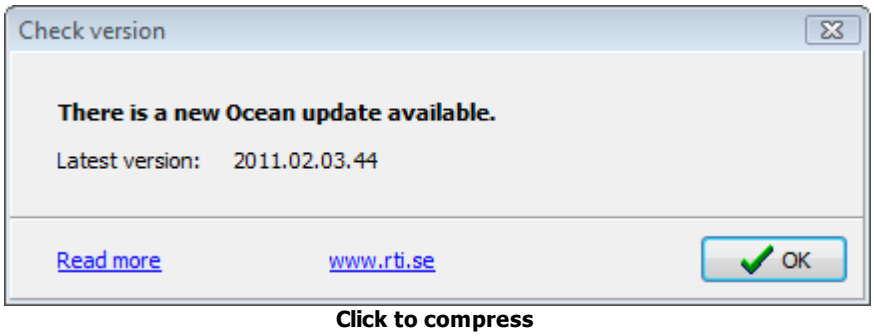
4. A message is displayed confirming that the license is installed:



The license is now installed in your meter and you will immediately be able use the new functions in Ocean. The main title bar will now indicate the new license level.

3.7.5 Check for update

If the computer running ocean has an internet connection, Ocean automatically checks if a newer version is available. This is done every time Ocean is started. A message will be shown to notify you that a newer version is available.



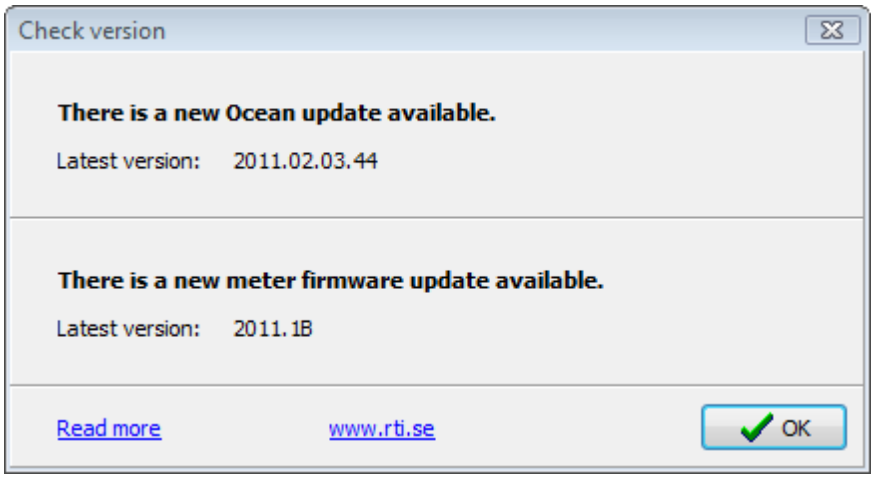
Click to compress

This message is shown only one time, click on the Check update button on the Help page of the ribbon bar if you want to initiate a check for newer version availability manually. There are two links to click on:

Read more - opens a document that shows what is new in the latest Ocean release.

www.rti.se - opens the RTI web page.

If the meter is connected (and "online") the firmware version is also checked. A message will inform you if there is a newer available.



Click to compress

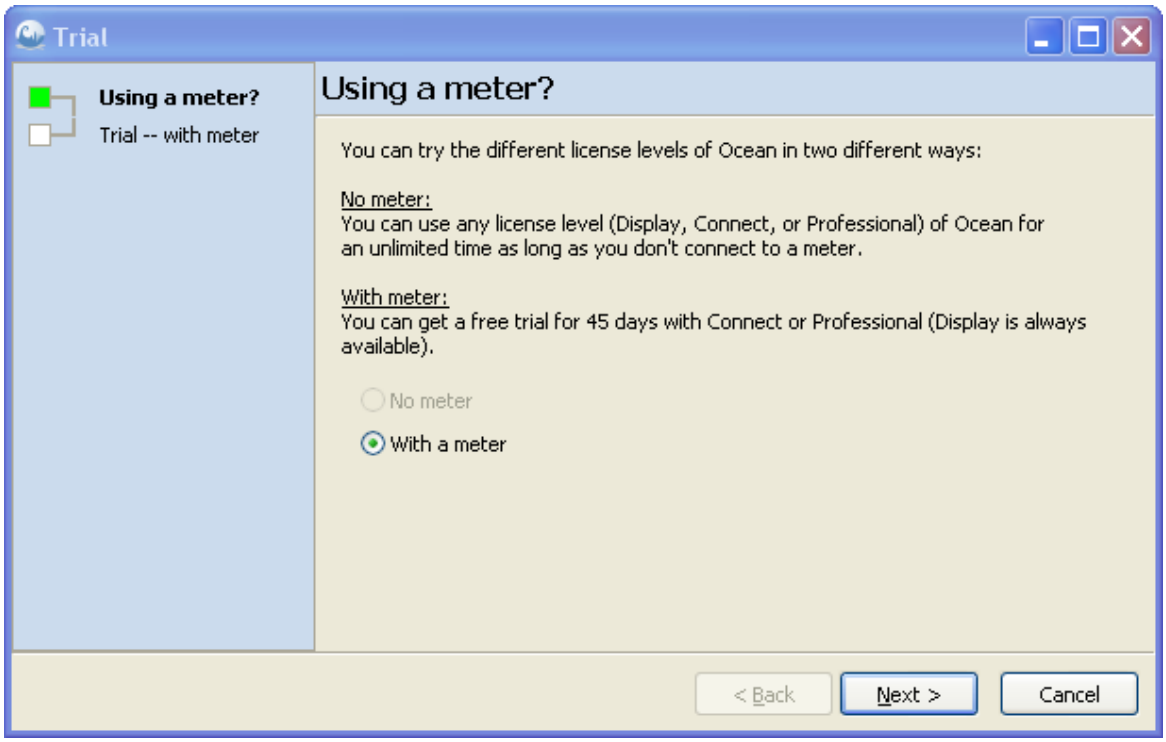
3.7.6 Trial

You can, if you are using Display or Connect license, try a higher license level for 45 days. This is something you can use only one time so don't activate it unless you really want to evaluate a more advanced version of Ocean. You can also activate a trial without a meter, there is no time limit in this case.

NOTE: You should be aware that when you are trying a higher license level, you may not be able to open all the objects you saved when you go back to your original license level.

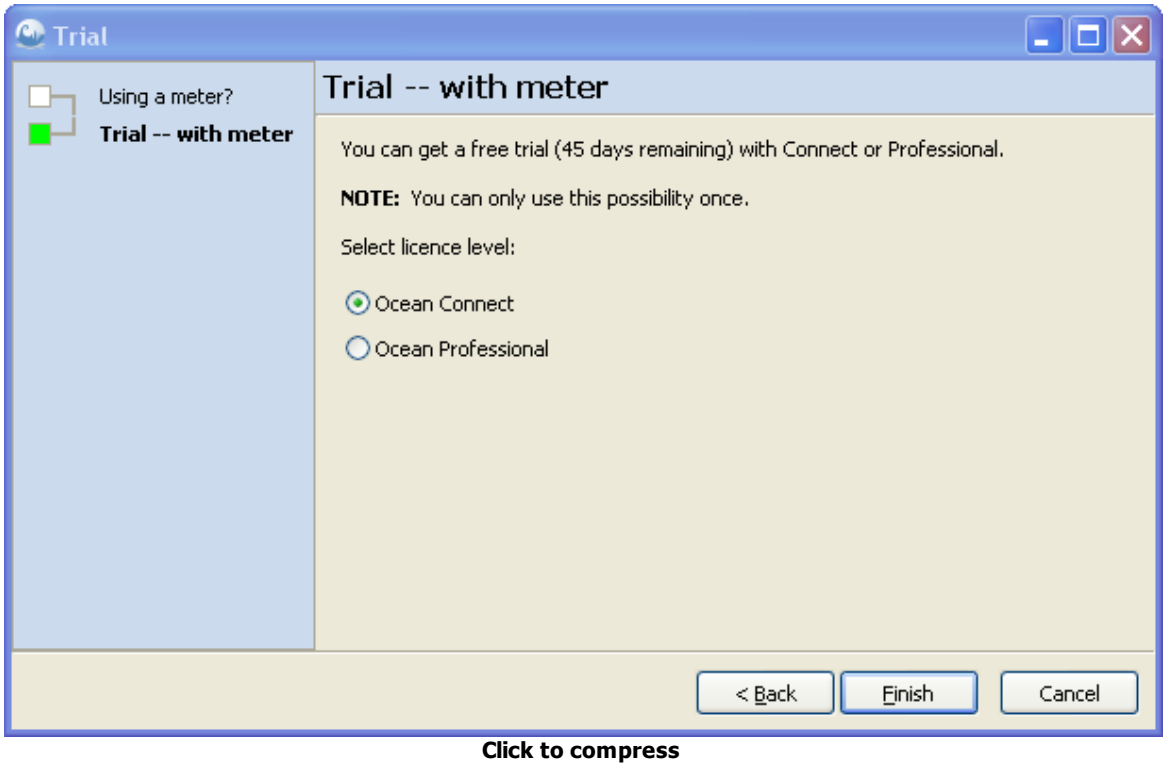
To star a trial period with a meter:

1. Make sure that your meter is online with Ocean.
2. Click the Trial button.
3. A wizard is shown:


Trial
Using a meter?
Trial -- with meter
Using a meter?
You can try the different license levels of Ocean in two different ways:
No meter:
You can use any license level (Display, Connect, or Professional) of Ocean for an unlimited time as long as you don't connect to a meter.
With meter:
You can get a free trial for 45 days with Connect or Professional (Display is always available).
No meter
With a meter
< Back
Next >
Cancel

Click to compress

4. Since the meter is online, only one choice (With meter) is available. Click Next to continue.
5. Select which license level you want to try (you can change this at any time during the 45 days).



Click to compress

6. Click Finish to complete the process.

7. The main title bar is now indicating the license level you selected. It will also show how many days you have remaining. A warning will be shown when 10 and 5 days are left, respectively.

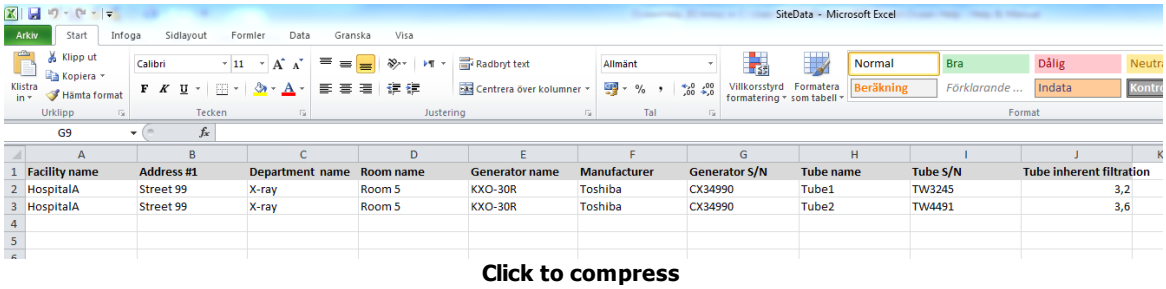
IMPORTANT!
The trial period is bound to your Ocean installation and not to your meter. This means that if you upgrade your meter during the trial period, it still indicates "Trial" until the 45 days expired.

3.7.7 Import site information

3.7.7.1 Import from Excel or Calc

It is possible to import site information (facility, department, room, generator, tube and user-def equipment) from Excel (or Calc). This example uses Excel but the procedure is the same with Calc.

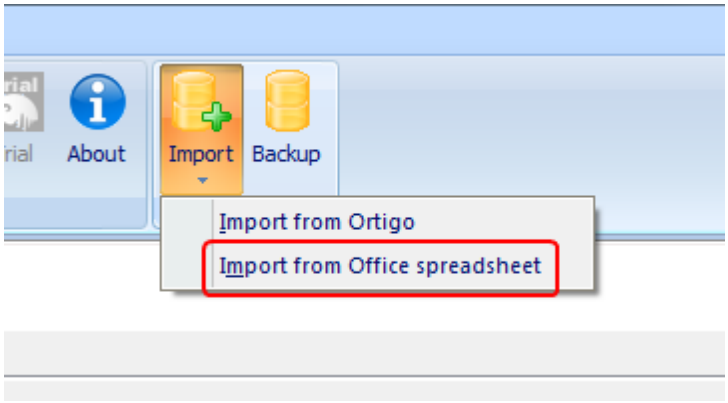
The site information should be organized in a list format:



	A	B	C	D	E	F	G	H	I	J
1	Facility name	Address #1	Department name	Room name	Generator name	Manufacturer	Generator S/N	Tube name	Tube S/N	Tube inherent filtration
2	HospitalA	Street 99	X-ray	Room 5	KXO-30R	Toshiba	CX34990	Tube1	TW3245	3,2
3	HospitalA	Street 99	X-ray	Room 5	KXO-30R	Toshiba	CX34990	Tube2	TW4491	3,6
4										
5										

Click to compress

1. Select Import from Office Spreadsheet.

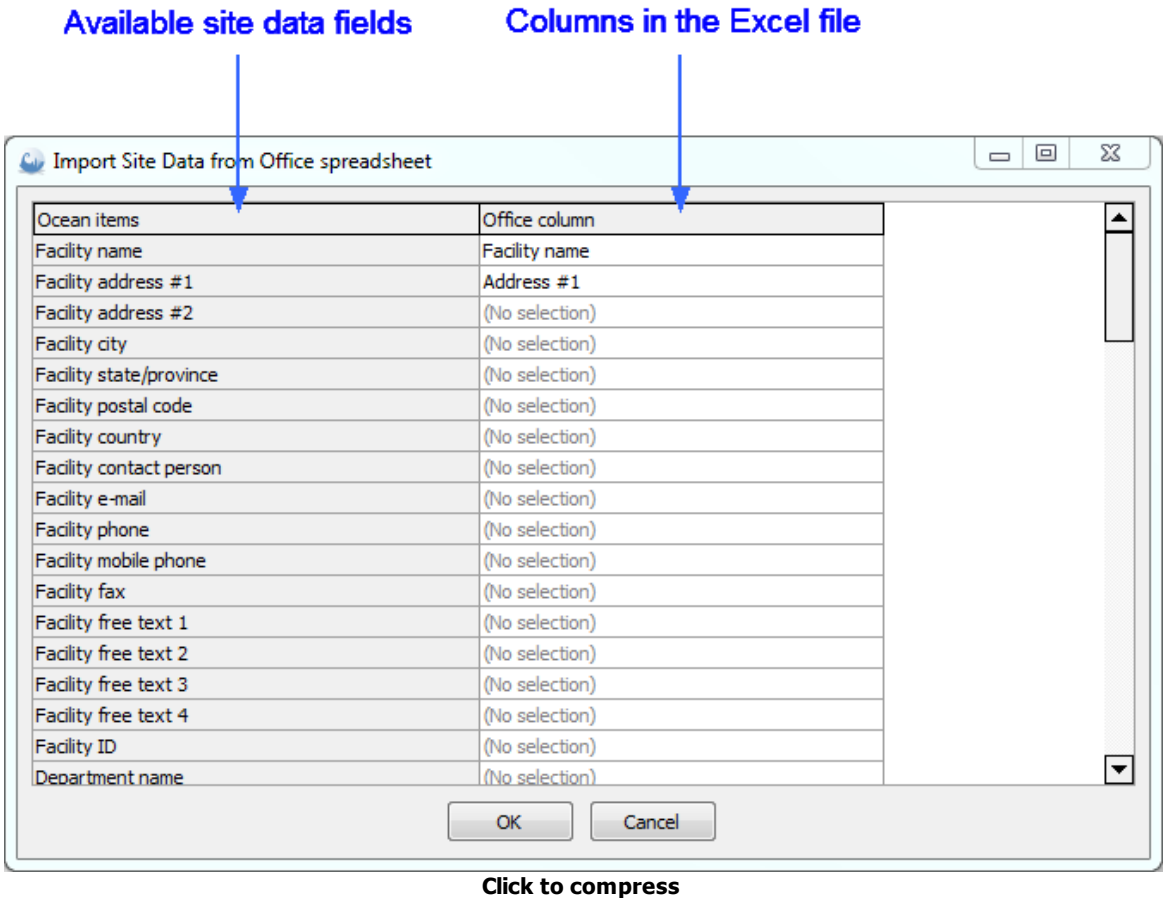


Click to compress

2. You are asked to do a backup of you database. It recommended to do so.

3. After the backup is completed a dialogue is shown that allows you to browse for the Excel file. Locate the Excel file and click Open.

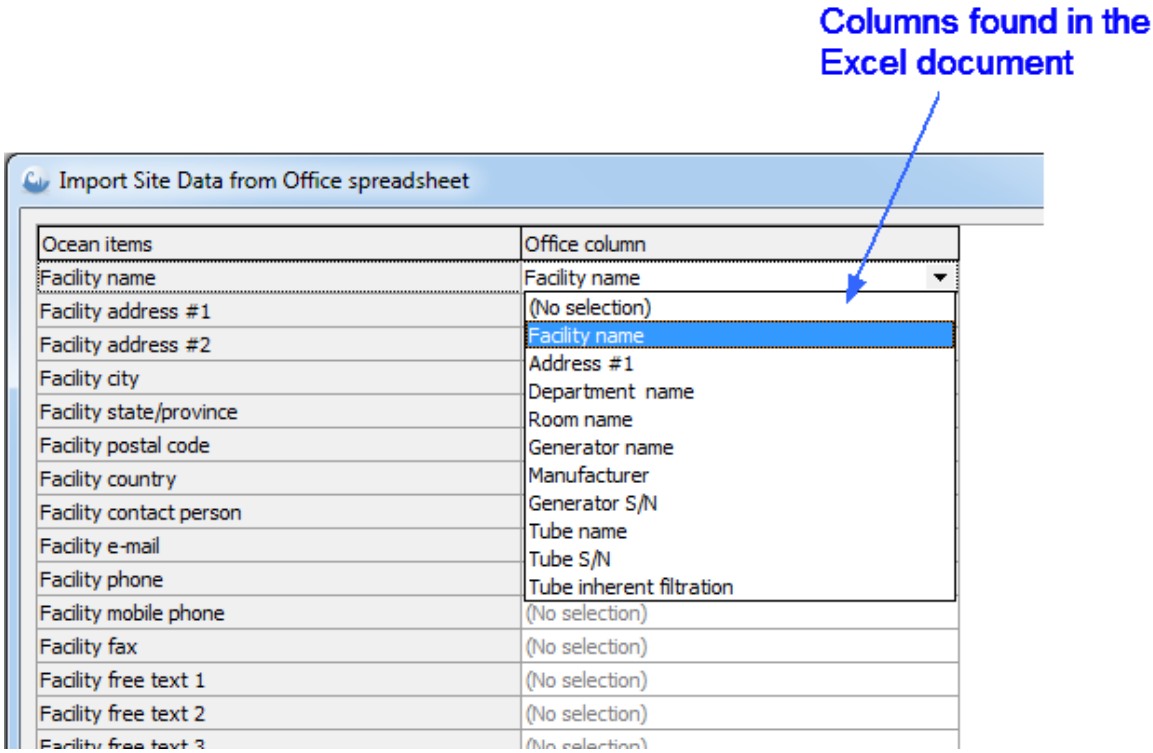
4. The Excel file is loaded and a dialogue is shown.



Click to compress

To the left are all the available Ocean fields to define the site information (facilities, departments, rooms, generator, tubes and user-defined equipment) shown. To the right are the columns in the Excel document shown.

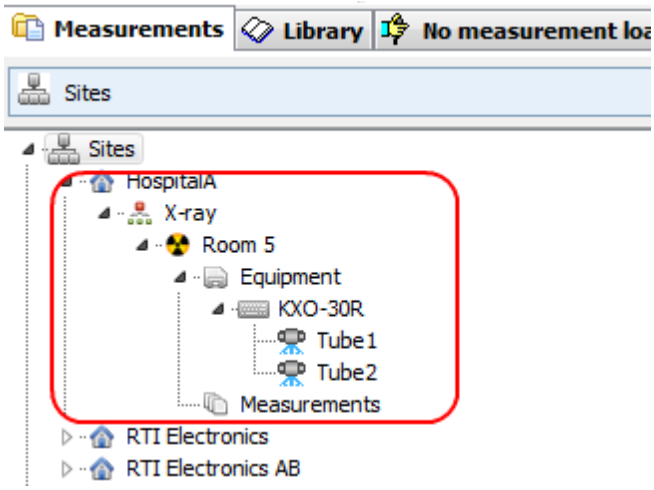
5. Click in a field in the right column to select which column that should be "tied" to an Ocean field in the left column:



Click to compress

6. When you are ready click on OK.

7. You can now see the imported site information in the database (Measurements).



Click to compress

The import is done "by name", if you repeat the import existing data will be overwritten (no duplicates are created).

3.7.7.2 Import from oRTIgo

If you are using oRTIgo you can import the sites (facilities, rooms, generators and tubes) you have in oRTIgo into Ocean. Since Ocean is a much more powerful tool with many more capabilities than oRTIgo was, we made the decision not to import old oRTIgo templates and measurements. We designed Ocean to be very user-friendly and you will find it will take a very short time to re-design any template to meet your measurement requirements that will give you the results oRTIgo gave and much more besides.

Follow the steps below to import your data from oRTIgo:

1. Go to the Help page on the ribbon bar.

2. Click on the button "Import from Ortigo".

3. Ocean will direct you to create a back-up of your database It is always a good practice to back up your data before attempting to import, just in case something happens during the import process.

4. After the backup is finished, Ocean will try to locate your oRTIgo database. If Ocean finds the database, it will appear pre-selected. If not, you must find and select it manually.

5. Click on the Open button.

6. As soon as you clicked the Open button, the import starts and a progress bar is shown. The import may take some time if you have a large database.

7. If the import was successful, you can click on the Measurements tab to find your imported sites.

8. Ocean is using a "department" level in the database that oRTIgo doesn't have. Ocean automatically places all rooms in a department called "Department".

NOTE: If you attempt to import the same database twice or you keep your data in two different places containing some of the same information and attempt to import a second time, your sites will be duplicated.

Chapter 4

Frequently asked questions

4 Frequently asked questions

This topic covers questions frequently are asked by Ocean users. The questions are organized by category.

4.1 General

Where can I find the reference manual?

Open the documentation folder on your product CD. Go to the Ocean folder and look up the file "Ocean - Reference Manual - English v1.0A.pdf".

I don't have a licence in my meter. How can I get one?

Every Ocean user must have a license to use Ocean. The free Display license is available for anyone by sending a request to RTI Electronics AB website at http://www.rti.se/try-ocean-for-free/. If you want to purchase the Connect or Professional license for your existing Piranha or Barracuda, or if you wish to purchase a new meter and Ocean, please contact your local distributor.

Can I make a back-up of the database?

Yes you can. Go to the help tab on the ribbon bar and click on the button Back-up.

Where is the Ocean database located?

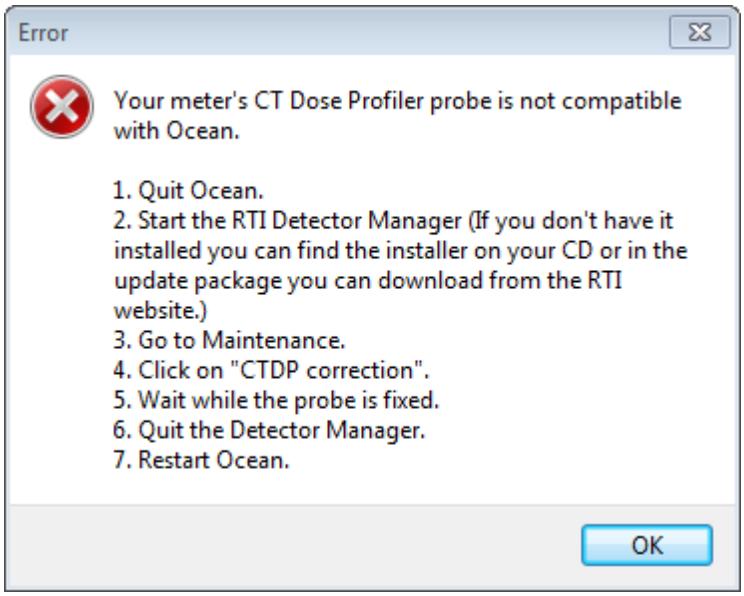
XP: Documents and Settings\All Users\Application Data\RTI Electronics\Ocean
Vista: ProgramData\RTI Electronics\Ocean

Can I import data from Ortigo?

You can import site data (facilities, rooms, generators and tubes) but not templates and measurements.

I get a strange message when I use my CT Dose Profiler probe?

Ocean says that the CT Dose profiler is not compatible and shows the following message:


Error
Your meter's CT Dose Profiler probe is not compatible with Ocean.
1. Quit Ocean.
2. Start the RTI Detector Manager (If you don't have it installed you can find the installer on your CD or in the update package you can download from the RTI website.)
3. Go to Maintenance.
4. Click on "CTDP correction".
5. Wait while the probe is fixed.
6. Quit the Detector Manager.
7. Restart Ocean.
OK

Click to compress

Piranha CT Dose Profiler Probes delivered before March 2012 has incorrect detector type stored in its memory. THis must be corrected before it can be used. THis is done, as described in the message, with the Detector Manager.

I have a CT-SD16 probe, why can't I see it in Ocean?
Ocean is not supporting this probe. You have to upgrade to a CT Dose Profiler probe if you want to measure CT dose profiles with Ocean.

4.2 Measuring

Why isn't the analysis giving a result, it is just showing "---"?
The analysis cannot do the required calculations. This is normally caused by:

- A missing measured value (too few measurements).
- There is a measuring error of some kind.
- A set value is missing or not specified correctly.

Ocean is not connecting to my meter?
If you are using USB, please check that the cable is connected properly. If you are using BLUETOOTH, open Windows BLUETOOTH device window and verify that your meter is listed as a know BLUETOOTH device. If it is listed but you still can't connect, delete it and use "Find nearby devices" to re-connect.

My measured data was not saved. Why?
You are maybe working with a template in design mode. When you click on save in design mode, only the template is saved. You must be in Log mode if you want your measured data to be saved.

I cannot edit a set value in a test. Why?
This normally happens when you are working with a session and the template you are trying to edit not open (active). You can look at all tests/checklists in a session, but you can only modify the one that is currently active.

Where can I specify the scatter factor?
In Ocean the scatter factor is called "Beam correction factor". This factor can be used to apply a correction on the measured exposure or exposure rate. You can find this parameter on the meter adjust tabs for exposure detectors or in the grid if specified as column or general setting.

4.3 Data export to Excel or Calc

Can I export certain cells from an Ocean test to Excel?
Yes you can. You can use something that is called "Cell-to-cell". You can then "link" individual cells in Ocean with individual cells in Excel or OpenOffice Calc. By doing this, you get full control over where your data appears in the spreadsheet. You can read more in the topic Link a session to Excel (or OpenOffice Calc).

4.4 Design

I cannot edit a set value in a test. Why?
This normally happens when you are working with a session and the template you are trying to edit not open (active). You can look at all tests/checklists in a session, but you can only modify the one that is currently active.

Can I change the acceptance limits in a test?

Yes. Right-click on the analysis window and click on "Modify analysis", select the analysis you want to change the limits for. The limits are now shown and you can modify them. Read more in topic Acceptance limits.

Can I have different acceptance limits for each row in a test?

Yes. Right-click on the analysis window and click on "Modify analysis", select the analysis you want to change the limits for. The limits are now shown and you can modify them for individual rows. Read more in topic Acceptance limits.

What is a template?

There are four different types of templates:

- Test template
- Checklist template
- Session template
- Real-time display template

A template is an object without any measured data but with all other necessary information to perform a measurement and required analysis.

I want to see my exposure values both in "R" and "mGy". Can I do that?

Yes. You can just right-click on the column head and select "Unit" from the menu. If you are working with a real-time display, just click on the unit in the display. A list with available units is shown, select the unit you want.

Where can I specify the scatter factor?

In Ocean the scatter factor is called "Beam correction factor". This factor can be used to apply a correction on the measured exposure or exposure rate. You can find this parameter on the meter adjust tabs for exposure detectors or in the grid if specified as column or general setting.

4.5 Reporting

Why don't I get any waveforms in the report?

There are no waveforms included in the report by default. You must select waveforms you want to appear in the report manually. To include a waveform in the report, right-click on a row in the grid and select "Include waveform(s) in report".

Can I exclude columns from the report?

Yes. It is possible to exclude columns (and other items) from the report. To exclude a column from the report, right-click on the column heading. Uncheck "Include in report" to remove the column from the report.

Can I design my own report?

No. The report template is fixed at this time.

Chapter 5

Appendix

5 Appendix

5.1 k-factors

The table below shows the k-factors Ocean uses. There bis one factor for head and body, respectively. The k-factors are based on data from impactctscan.org.

Manufacturer	Name	kVp	Head	Body
Elscint	Exel 2400 Elect	120	1,069	1,527
Elscint	Exel 2400 Elect	140		1,430
Elscint	CT Twin	120	1,047	1,466
Elscint	Helicat	120	1,047	1,466
GE	8800/9000 Series	120	0,962	1,680
GE	9800 Series	120	1,038	1,585
GE	9800 Series	140	1,020	1,503
GE	HiLight	80	1,047	1,600
GE	HiLight	100	1,008	1,636
GE	HiLight	120	1,030	1,605
GE	HiLight	140	1,015	1,571
GE	HiSpeed CT/i no SmartBeam	80	1,047	1,600
GE	HiSpeed CT/i no SmartBeam	100	1,008	1,636
GE	HiSpeed CT/i no SmartBeam	120	1,030	1,605
GE	HiSpeed CT/i no SmartBeam	140	1,015	1,571
GE	HiSpeed CT/i with SmartBeam	80	1,047	2,093
GE	HiSpeed CT/i with SmartBeam	100	1,008	1,827
GE	HiSpeed CT/i with SmartBeam	120	1,030	1,607
GE	HiSpeed CT/i with SmartBeam	140	1,015	1,568
GE	CT Max	120	0,961	1,505
GE	Pace	80	1,162	2,164
GE	Pace	120	1,053	1,734
GE	Pace	135	1,041	1,627
GE	Pace	140	1,061	1,636
GE	Sytec	80	1,162	2,164
GE	Sytec	120	1,053	1,734
GE	Sytec	135	1,041	1,627
GE	Sytec	140	1,061	1,636
GE	Prospeed	120	1,052	1,713
GE	Prospeed	140	1,040	1,610
GE	FX/i	80	1,145	2,213
GE	FX/i	120	1,058	1,692
GE	FX/i	140	1,037	1,605
GE	LX/i	80	1,145	2,213
GE	LX/i	120	1,058	1,692
GE	LX/i	140	1,037	1,605
GE	QX/i	80	1,032	1,927
GE	QX/i	100	0,999	1,730
GE	QX/i	120	0,987	1,633
GE	QX/i	140	0,977	1,570
GE	LightSpeed	80	1,032	1,927
GE	LightSpeed	100	0,999	1,730
GE	LightSpeed	120	0,987	1,633
GE	LightSpeed	140	0,977	1,570
GE	LightSpeed Plus	80	1,032	1,927
GE	LightSpeed Plus	100	0,999	1,730
GE	LightSpeed Plus	120	0,987	1,633
GE	LightSpeed Plus	140	0,977	1,570
GE	HiSpeed ZX/i	80	1,027	1,810
GE	HiSpeed ZX/i	120	0,993	1,500

GE	HiSpeed ZX/i	140	0,968	1,480
GE	HiSpeed NX/i	80	1,027	1,810
GE	HiSpeed NX/i	120	0,993	1,500
GE	HiSpeed NX/i	140	0,968	1,480
GE	LightSpeed Ultra	80	1,042	2,009
GE	LightSpeed Ultra	100	1,009	1,787
GE	LightSpeed Ultra	120	0,994	1,656
GE	LightSpeed Ultra	140	0,985	1,614
GE	LightSpeed 16	80	1,046	1,819
GE	LightSpeed 16	100	1,010	1,627
GE	LightSpeed 16	120	0,993	1,611
GE	LightSpeed 16	140	0,984	1,483
GE	LightSpeed Pro 16	80	1,057	1,996
GE	LightSpeed Pro 16	100	1,013	1,771
GE	LightSpeed Pro 16	120	0,994	1,652
GE	LightSpeed Pro 16	140	0,983	1,577
GE	LightSpeed RT	80	1,093	2,140
GE	LightSpeed RT	100	1,052	1,897
GE	LightSpeed RT	120	1,028	1,770
GE	LightSpeed RT	140	1,015	1,694
GE	LightSpeed VCT	80	1,136	2,046
GE	LightSpeed VCT	100	1,088	1,778
GE	LightSpeed VCT	120	1,066	1,648
GE	LightSpeed VCT	140	1,048	1,566
GE	LightSpeed VCT (small hd, large bd)	80	1,061	2,041
GE	LightSpeed VCT (small hd, large bd)	100	1,022	1,802
GE	LightSpeed VCT (small hd, large bd)	120	1,004	1,684
GE	LightSpeed VCT (small hd, large bd)	140	0,993	1,614
Philips	Philips 310 (GE2, no Cu)	120	1,089	
Philips	Philips 350 (GE2, no Cu)	120	1,089	
Philips	Philips 310 (GE2, w. Cu)	120	1,025	
Philips	Philips 350 (GE2, w. Cu)	120	1,025	
Philips	Philips 310 (GE3, no Cu)	120		1,956
Philips	Philips 350 (GE3, no Cu)	120		1,956
Philips	Philips 310 (GE3, w. Cu)	120		
Philips	Philips 350 (GE3, w. Cu)	120		
Philips	Philips AV	80	1,120	2,034
Philips	Philips AV	100	1,061	1,795
Philips	Philips AV	120	1,061	1,718
Philips	Philips AV	130	1,066	1,739
Philips	Philips AV	140	1,048	1,666
Philips	Philips LX	80	1,120	2,034
Philips	Philips LX	100	1,061	1,795
Philips	Philips LX	120	1,061	1,718
Philips	Philips LX	130	1,066	1,739
Philips	Philips LX	140	1,048	1,666
Philips	Philips SR7000	80	1,120	2,034
Philips	Philips SR7000	100	1,061	1,795
Philips	Philips SR7000	120	1,061	1,718
Philips	Philips SR7000	130	1,066	1,739
Philips	Philips SR7000	140	1,048	1,666
Philips	Philips CX	120	1,059	1,572
Philips	Philips CX/S	120	1,059	1,572
Philips	Philips SR4000	120	1,053	1,724
Philips	Philips SR 5000	120	1,065	1,768
Philips	Philips SR 5000	130	1,052	1,886
Philips	Philips M/EG	120	1,199	2,640
Philips	Philips M/EG	130	1,196	2,631
Philips	Philips TX	100		
Philips	Philips TX	120	1,038	
Philips	Philips TX	130		
Philips	Philips CT Secura	120	1,060	1,688

Philips	Philips CT Secura	140	1,052	1,638
Philips	Philips Mx8000	90	1,096	1,888
Philips	Philips Mx8000	120	1,061	1,683
Philips	Philips Mx8000	140		1,653
Philips	Philips AcQSim	120	1,130	2,057
Philips	Philips AcQSim	130	1,114	1,983
Philips	Mx8000 IDT/Brilliance 16 (& Power)	90	1,072	1,765
Philips	Mx8000 IDT/Brilliance 16 (& Power)	120	1,059	1,623
Philips	Mx8000 IDT/Brilliance 16 (& Power)	140	1,062	1,554
Philips	Philips Aura	120	1,114	1,667
Philips	Philips Big Bore	90	1,113	1,996
Philips	Philips Big Bore	120	1,083	1,778
Philips	Philips Big Bore	140	1,063	1,718
Picker	Picker 1200SX	80		3,008
Picker	Picker 1200SX	120	0,950	2,087
Picker	Picker 1200SX	130	1,018	2,053
Picker	Picker 1200SX	140	0,895	1,938
Picker	Picker PQ Series	120	0,966	1,960
Picker	Picker PQ Series	130	0,950	2,053
Picker	Picker PQ Series	140	0,950	1,937
Picker	Picker UltraZ	80	1,076	3,328
Picker	Picker UltraZ	100	1,047	2,185
Picker	Picker UltraZ	120	0,977	1,955
Picker	Picker UltraZ	130	0,965	1,926
Picker	Picker UltraZ	140	0,960	1,868
Philips	Philips/Marconi Mx8000	90	1,096	1,888
Marconi	Marconi Mx8000	90	1,096	1,888
Marconi	Marconi Mx8000	120	1,061	1,683
Marconi	Marconi Mx8000	140		1,653
Marconi	Marconi AcQSim	120	1,130	2,057
Marconi	Marconi AcQSim	130	1,114	1,983
Shimadzu	Shimadzu SCT	80	1,134	2,470
Shimadzu	Shimadzu SCT	120	1,079	1,992
Shimadzu	Shimadzu SCT	130	1,070	1,984
Siemens	Siemens CR	125	1,121	2,164
Siemens	Siemens CR512	125	1,121	2,164
Siemens	Siemens DRH	125	1,121	2,164
Siemens	Siemens Somatom 2	125	1,117	2,190
Siemens	Siemens DR1/2/3	125	1,117	2,190
Siemens	Siemens DRG	125		
Siemens	Siemens DRG1	125		
Siemens	Somatom Plus 4 Series	80	1,100	2,047
Siemens	Somatom Plus 4 Series	120	1,075	1,782
Siemens	Somatom Plus 4 Series	140	1,062	1,738
Siemens	Somatom AR-C	110	1,076	1,817
Siemens	Somatom AR-C	130	1,067	1,736
Siemens	Somatom AR.SP	110	1,076	1,817
Siemens	Somatom AR.SP	130	1,067	1,736
Siemens	Somatom AR-T	110	1,076	1,817
Siemens	Somatom AR-T	130	1,067	1,736
Siemens	Siemens AR.HP	130	1,036	1,565
Siemens	Siemens Plus	120	1,102	1,789
Siemens	Siemens Plus	137	1,068	1,749
Siemens	Siemens DXP	120	1,102	1,789
Siemens	Siemens DXP	137	1,068	1,749
Siemens	Siemens Plus-S	120	1,102	1,789
Siemens	Siemens Plus-S	137	1,068	1,749
Siemens	Siemens Hi Q	133	1,079	2,027
Siemens	Siemens Balance	110	1,085	1,806
Siemens	Siemens Balance	130	1,074	1,729
Siemens	Siemens Emotion	110	1,085	1,806
Siemens	Siemens Emotion	130	1,074	1,729

Siemens	Siemens Volume Zoom	80	1,201	2,135
Siemens	Siemens Volume Zoom	120	1,124	1,750
Siemens	Siemens Volume Zoom	140	1,107	1,696
Siemens	Access	80	1,201	2,135
Siemens	Access	120	1,124	1,750
Siemens	Access	140	1,107	1,696
Siemens	Emotion Duo	80	1,108	1,951
Siemens	Emotion Duo	110	1,055	1,666
Siemens	Emotion Duo	130	1,039	1,606
Siemens	Sensation 4	80	1,156	1,939
Siemens	Sensation 4	120	1,086	1,656
Siemens	Sensation 4	140		1,602
Siemens	Sensation 16	80	1,142	1,893
Siemens	Sensation 16	100	1,103	1,743
Siemens	Sensation 16	120	1,079	1,639
Siemens	Sensation 16	140		1,584
Siemens	Sensation 16 Straton	80	1,258	1,893
Siemens	Sensation 16 Straton	100	1,209	1,663
Siemens	Sensation 16 Straton	120	1,088	1,629
Siemens	Sensation 16 Straton	140		1,571
Siemens	Emotion 6	80	0,821	1,751
Siemens	Emotion 6	110	0,854	1,584
Siemens	Emotion 6	130	1,024	1,526
Siemens	Sensation 10	80	1,155	1,893
Siemens	Sensation 10	100	1,111	1,743
Siemens	Sensation 10	120	1,086	1,639
Siemens	Sensation 10	140		1,584
Siemens	Sensation Open	80	1,071	1,812
Siemens	Sensation Open	100	1,046	1,674
Siemens	Sensation Open	120	1,037	1,601
Siemens	Sensation Open	140		1,558
Siemens	Sensation 64	80	1,042	1,684
Siemens	Sensation 64	100	1,027	1,581
Siemens	Sensation 64	120	1,022	1,532
Siemens	Sensation 64	140		1,538
Siemens	Definition AS	80	1,054	1,851
Siemens	Definition AS	100	1,036	1,680
Siemens	Definition AS	120	1,031	1,587
Siemens	Definition AS	140	1,027	1,525
Toshiba	Toshiba TCT 600	120	0,987	1,527
Toshiba	Xspeed II	120	0,995	1,598
Toshiba	Xpress GX (Pre '98)	120	1,035	
Toshiba	Xvision/EX	120	0,952	1,354
Toshiba	Xpress HS1	120	1,039	1,369
Toshiba	Xpress HS	120	1,000	1,359
Toshiba	Xpress GX (Post '98), Asteion	120	1,035	1,501
Toshiba	Xpress GX (Post '98), Asteion	130	1,017	1,472
Toshiba	Asteion	120	1,035	1,501
Toshiba	Asteion	130	1,017	1,472
Toshiba	Aquilion Multi/4	80	1,117	2,072
Toshiba	Aquilion Multi/4	100	1,079	1,846
Toshiba	Aquilion Multi/4	120	1,057	1,728
Toshiba	Aquilion Multi/4	135	1,034	1,672
Toshiba	Auklet	120	1,019	1,470
Toshiba	Asteion Multi (older tube)	80	1,141	2,131
Toshiba	Asteion Multi (older tube)	100	1,099	2,039
Toshiba	Asteion Multi (older tube)	120	1,076	1,731
Toshiba	Asteion Multi (older tube)	135	1,062	1,841
Toshiba	Asteion Multi (CXB-400C tube)	80	1,141	2,131
Toshiba	Asteion Multi (CXB-400C tube)	100	1,099	2,039
Toshiba	Asteion Multi (CXB-400C tube)	120	1,076	1,731
Toshiba	Asteion Multi (CXB-400C tube)	135	1,062	1,841

Toshiba	Asteion Dual	120	1,117	1,857
Toshiba	Asteion Dual	135	1,070	1,685
Toshiba	Aquilion 16	80	1,147	2,206
Toshiba	Aquilion 16	100	1,070	1,959
Toshiba	Aquilion 16	120	1,056	1,779
Toshiba	Aquilion 16	135	1,051	1,728

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